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MIL-HDBK-TRNRS

DEPARTMENT OF DEFENSE
HANDBOOK

GUIDANCE FOR ACQUISITION OF TRAINERS AND TRAINING EQUIPMENT

This Handbook is for guidance only. Do not cite this document as a requirement.

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FOREWORD

1. This handbook is approved for use by all Departments and Agencies of the Department of Defense (DoD). This handbook is intended to provide guidance to DoD personnel on preparing solicitations and evaluating solicitation responses.

2. This handbook is intended for guidance only. This handbook cannot be cited as a requirement. If it is, the contractor does not have to comply.

3. The goal of MIL-HDBK-TRNRS is to provide guidance that may be used by all Services for the preparation of solicitations and evaluation of solicitation responses for operator and maintainer trainers. Emphasis has been placed on reducing costs, promoting commercial products and practices, and promoting the use of the latest technologies. Every effort has been made to ensure this document fosters these goals and does not act as a barrier. Guidance provided represents one approach to acquisition of trainers. Use of this guidance is not mandatory.

4. There are numerous ways to procure trainers. The acquisition guidance contained herein may not be applicable to your specific organization. DoD acquisition reform procedures are evolving. This handbook reflects guidance related to the use of the Statement Of Objectives (SOO) and Statement Of Work (SOW) approach.

5. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Air Warfare Center Aircraft Division, Code 414100B120-3, Highway 547, Lakehurst, NJ 08733-5100 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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1. SCOPE

1.1 Scope. This handbook provides guidance to Department of Defense (DoD) personnel on the procurement of trainers and training equipment. This handbook is intended for guidance only. This handbook cannot be cited as a requirement. If it is, the contractor does not have to comply.

1.1.1 Acquisition guidance. This handbook provides guidance to DoD personnel on preparing a Request For Proposal (RFP) when citing MIL-PRF-TRNRS as the required specification. The guidance provided in this handbook centers around the physical and functional features that may be included in trainers and does not specify the classification of trainers that they apply to, as they can be used in many combinations.

1.2 Trainer classifications. MIL-PRF-TRNRS deals with two (2) primary classifications of equipment required for training, they are: 1) trainers and 2) training equipment. These classifications do not limit or preclude the development of additional or different types. Combinations of trainers can be used to develop mission and scenario training systems to support individual and collective training.

1.2.1 Trainers. There are many nomenclatures for trainers. For the purpose of this document, there are three (3) categories of trainers referred to. Trainers are a relatively complex item of training equipment, using electronic, mechanical, or electronic and mechanical means to reproduce conditions required for student(s), to practice operator, maintainer, or other exercises to successfully accomplish the learning objective(s). Trainer types are as follows:

1.2.1.1 Platform and component trainers. Platform and component trainers utilize actual system components that function in the same manner as when installed in the end item and subsystems. These trainers use actual systems, subsystems, and assemblies. These systems, subsystems, and assemblies are located in the trainer to represent their actual location in the end item and subsystems. The trainer will be equipped with actual wiring, plugs, mounting racks, securing devices, and other hardware required to enhance the realism of training.

1.2.1.2 Simulator trainers. Simulator trainers reproduce the functions of actual equipment, systems, scenarios, or hostile environments by synthetically providing a desired condition or set of conditions.

1.2.1.3 Combination platform/component/simulator (i.e., hybrid) trainers. Combination platform/component/simulator (i.e., hybrid) trainers are a combination of platform systems utilizing actual components and simulated components functioning to provide a replica of the systems as installed. Hybrid trainers can be constructed with varying combinations of hardware and simulation dependent upon specified learning objectives. Actual system components may be

used, represented, stimulated, simulated, presented, or a combination of these methods may be used.

1.2.2 Training equipment. Training equipment includes end items or systems that have been modified for training. Training equipment also includes equipment groups, mock-ups, animated displays, task trainers, function trainers, and other equipment and software necessary to support the transfer of knowledge and skills. The word "trainer" hereafter used in this handbook is meant to include both trainers and training equipment.

1.3 Training data products. To procure training data products that support trainer functionality, refer to MIL-PRF-29612. For guidance on which training data products may apply, refer to 5.3.18 in this document.

1.4 Additional acquisition guidance. In addition to providing guidance for the acquisition of trainers, this handbook also includes tailoring guidance for the MIL-PRF-TRNRS, Performance Specification, Trainers and Training Equipment; MIL-PRF-29612, Performance Specification, Training Data Products; and applicable Data Item Descriptions (DID) in relation to trainers.

1.5 Introduction of the Statement Of Objectives (SOO). This handbook includes a concept called the SOO. Following DoD direction to lower Government costs by encouraging innovative contract options and flexible design solutions, the SOO captures the top-level objectives of an RFP and allows the offerors freedom in the structure and definition of Statement Of Work (SOW) tasks as they apply to the proposed approach. See MIL-HDBK-245 for additional details for the preparation of SOWs.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed below are not necessarily all of the documents referenced herein, but are the ones that are needed in order to fully understand the information provided by this handbook.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document. Unless otherwise specified, the issues of these documents are those listed in the latest issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto.

SPECIFICATIONS

MIL-PRF-TRNRS Performance Specification, Trainers and Training Equipment

MIL-PRF-29612	Performance Specification, Training Data Products

STANDARDS

DEPARTMENT OF DEFENSE

MIL-STD-129	Standard Practice for Military Marking
MIL-STD-464	Electromagnetic Environmental Effects Requirements for Systems
MIL-STD-1472	Human Engineering

HANDBOOKS

DEPARTMENT OF DEFENSE

MIL-HDBK-245	Preparation of Statement Of Work (SOW)
MIL-HDBK-470	Designing and Developing Maintainable Products and Systems, Volume I and Volume II
MIL-HDBK-512	Parts Management
MIL-HDBK-781	Reliability Test Methods, Plans, and Environments for Engineering Development, Qualification, and Production
MIL-HDBK-808	Finish, Protective and Codes for Finishing Schemes for Ground and Ground Support Equipment
MIL-HDBK-2155	Failure Reporting, Analysis and Corrective Action Taken
MIL-HDBK-29612-1	Guidance for Acquisition of Training Data Products and Services
MIL-HDBK-29612-3	Department of Defense Handbook, Development of Interactive Multimedia Instruction (IMI)
MIL-HDBK-29612-4	Department of Defense Handbook, Glossary for Training

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094. These documents may also be downloaded from the Uniform Resource Locator (URL): http://astimage.daps.dla.mil/online/new.)

2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document.

U.S. FOOD AND DRUG ADMINISTRATION (FDA)

21 CFR 1040.10	Performance Standard for Light-Emitting Products: Laser Products
21 CFR 1040.11	Performance Standard for Light-Emitting Products: Specific Purpose Laser Products

(U.S. Food and Drug Administration, 5600 Fishers Lane, Rockville, MD 20857. These documents may also be downloaded from URL: www.fda.gov.)

DoD HLA	High Level Architecture (HLA)
DoD 5000.2-R	Mandatory Procedures for Major Defense Acquisition Program (MDAP) and Major Automated Information Systems (MAIS)
OUSD Memo	DoD Joint Technical Architecture (JTA)
SCORM	Sharable Content Object Reference Model (SCORM)

(The HLA can be downloaded from http://www.ntsc.navy.mil.)

(The DoD 5000.2-R can be downloaded from http://www.acq.osd.mil.)

(The JTA can be downloaded from http://www-jta.itsi.disa.mil.)

(The SCORM can be downloaded from http://www.adlnet.org.)

2.3 Non-Government publications. The following document(s) form a part of this document. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the latest issue of the DoDISS, and supplement thereto.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI-A156.18	Materials and Finishes (i.e., Builders Hardware Manufacturers Association (BHMA)-A156.18)
ANSI Z136.1	American National Standard For the Safe Use of Lasers

(Application for copies should be addressed to the American National Standards Institute 1819 L Street NW, 6th Floor, Washington DC, 20036. These documents may also be downloaded from URL: http://web.ansi.org.)

INSTITUTE of ELECTRICAL and ELECTRONICS ENGINEERS (IEEE)

IEEE 1516.0	Standard for Modeling and Simulation (M&S) High Level Architecture (HLA) - Framework and Rules

IEEE 1516.1	Standard for Modeling and Simulation (M&S) High Level Architecture (HLA) - Federate Interface Specification
IEEE 1516.2	Standard for Modeling and Simulation (M&S) High Level Architecture (HLA) - Object Model Template (OMT) Specification
IEEE 12207.0	Standard for Information Technology Software Life Cycle Processes (DoD Adopted)

(Application for copies should be addressed to the Institute of Electrical and Electronics Engineers, 445 Hoes Lane, Piscataway, NJ, 08855. These documents may also be downloaded from URL: www.ieee.org.)

NATIONAL FIRE PROTECTION AGENCY (NFPA)

NFPA 70	National Electric Code (DoD Adopted)

(Application for copies should be addressed to the National Fire Protection Agency, 1 Batterymarch Park, Quincy, MA, 02269. These documents may also be downloaded from URL: www.nfpa.org.)

AMERICAN SOCIETY for QUALITY (ASQ)

ASQC-Q9000.1	Quality Management and Quality Assurance Standards - Guidelines for Selection and Use (DoD Adopted)

(Application for copies should be addressed to the American Society for Quality, 600 North Plankinton Avenue, Milwaukee, WI, 53203. These documents may also be downloaded from URL: www.asq.org.)

ELECTRONIC INDUSTRIES ALLIANCE (EIA)

EIA 649	National Consensus Standard for Configuration Management (DoD Adopted)

(Application for copies should be addressed to the Electronic Industries Alliance, 2500 Wilson Boulevard, Arlington, VA 22201-3834. These documents may also be downloaded from URL: www.eia.org.)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document,

however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. DEFINITIONS

3.1 General. Acronyms used in this handbook are listed below. Definitions, abbreviations, and acronyms that apply specifically to trainers are provided in MIL-PRF-TRNRS, Performance Specification, Trainers and Training Equipment. Additionally, MIL-HDBK-29612-4, Department of Defense Handbook, Glossary for Training provides training related definitions and acronyms that may be relevant to this handbook.

ACRONYM	USAGE
ACT	Acquisition Coordination Team
A_i	Inherent Availability
AMSDL	Acquisition Management Systems and Data Requirements Control List
ANSI	American National Standards Institute
A_o	Operational Availability
ASQ	American Society for Quality
ATP	Acceptance Test Procedure
BHMA	Builders Hardware Manufacturers Association
CaNDI	Commercial and Non-Developmental Items
CDR	Critical Design Review
CDRL	Contract Data Requirements List
CFE	Contractor Furnished Equipment
CFSR	Contract Funds Status Report
CLIN	Contract Line Item Number
CLS	Contractor Logistics Support
CM	Configuration Management
COMS	Contractor Operation and Maintenance Support
CONUS	Continental United States
CSCI	Computer Software Configuration Item
CWBS	Contract Work Breakdown Structure
DID	Data Item Description
DoD	Department of Defense
DoDISS	Department of Defense Index of Specifications and Standards
ECP	Engineering Change Proposal
EIA	Electronic Industries Alliance
EMI	Electromagnetic Interference
EPA	Environmental Protection Agency
ESD	Electrostatic Discharge

ACRONYM	USAGE
FCA	Functional Configuration Audit
FDA	Food and Drug Administration
FEDEP	Federal Development and Execution Process
FMEA	Failure Modes and Effects Analysis
FMECA	Failure Modes, Effects and Criticality Analysis
FRACAS	Failure Reporting, Analysis, and Corrective Action System
GFE	Government Furnished Equipment
GSE	Ground Support Equipment
HLA	High Level Architecture
IEEE	Institute of Electrical and Electronics Engineers
IMI	Interactive Multimedia Instruction
I/O	Input/output
IOC	Initial Operational Capability
IPB	Illustrated Parts Breakdown
IPT	Integrated Product Team
ISD	Instructional Systems Development
ISD/SAT	Instructional Systems Development/Systems Approach to Training
JTA	Joint Technical Architecture
LCAC	Landing Craft, Air Cushion
LO	Learning Objective
M&S	Modeling and Simulation
MAIS	Major Automated Information System
MDA	Milestone Decision Authority
MDAP	Major Defense Acquisition Program
MOMI	Manuals of Operation and Maintenance Instruction
MPT	Manpower, Personnel, and Training
MWO	Modification Work Orders
NATO	North Atlantic Treaty Organization
NFPA	National Fire Protection Agency
ODS	Ozone Depleting Substance
OMT	Object Model Template
OSHA	Occupational Safety and Health Administration
OUSD	Office of the Undersecretary of Defense
PCA	Physical Configuration Audit
PDR	Preliminary Design Review
PIND	Particle Impact Noise Detection
QA	Quality Assurance
QAR	Quality Assurance Representative
RDGT	Reliability Development and Growth Test

ACRONYM	USAGE
RF	Radio Frequency
RFI	Ready For Issue
RFP	Request For Proposal
SCA	Sneak Circuit Analysis
SE	Support Equipment
SCORM	Sharable Content Object Reference Model
SME	Subject Matter Expert
SOO	Statement Of Objectives
SOW	Statement Of Work
SPS	Software Product Specification
SRA	Shop Replaceable Assembly
SRR	System Requirements Review
SRS	Software Requirements Specification
SSR	Software Specification Review
STANAGS	Standardized Agreements
T&E	Test and Evaluation
TCS	Trainer Computer System
TCSS	Trainer Computer System Software
TD	Technical Directive
TEMP	Test and Evaluation Master Plan
TMCR	Technical Manual Contract Requirements
TPE	Trainer Peculiar Equipment
TRR	Test Readiness Review
TSS	Trainer System Software
URL	Uniform Resource Locator

4. GENERAL GUIDANCE FOR TRAINER ACQUISITION

4.1 General guidance. This section provides general guidance applicable to RFPs for trainers and related services. The RFP defines the Government's requirements and constitutes the cornerstone of the program, as it ultimately shapes the resultant contract. Consult with your contracting officer whenever specific procurement information is needed.

4.2 Pre-RFP. Various actions should occur prior to the development of the RFP. The scope of these actions usually depends upon the complexity and/or estimated cost of the acquisition. The following provides general guidance on trainer requirements, Test and Evaluation Master Plan (TEMP), acquisition strategy, and acquisition plan development that may be required prior to RFP preparation.

4.2.1 Trainer requirements identification. Prior to initiating the trainer acquisition process, a trainer requirements analysis should have been conducted and trainer functional performance identified. The following provides further details regarding these processes. (Also, see MIL-PRF-29612, paragraphs 3.2.1 and 3.2.3.)

4.2.1.1 Trainer needs analysis. A trainer needs analysis is performed at appropriate decision points in the training program. It may be appropriate when preparing for a modification to a training program due to the introduction of new weapon systems. It may also be appropriate when the efficiency of an existing training program requires verification. The following is a list of efforts that may be performed in accomplishing the training situation analysis. This list is provided as information to the acquisition manager and is not all-inclusive. See MIL-HDBK-29612-2 for additional guidance. Efforts include:

a. Analyze the existing situation.
b. Develop a situation statement.
c. Develop impact statements.
d. Identify solutions/alternatives.
e. Develop recommendations.
f. Analyze similar systems.
g. Identify optimal number and mix of training equipment and optimal simulation and instructional features for each type of trainer under study.

4.2.1.2 Trainer functional performance requirements analysis. Prior to the development of the RFP, a trainer functional requirements analysis should be performed. The results of the analysis will provide the baseline for performance specifications that may be used in an RFP for the trainer(s). The following is a list of efforts that may be performed in accomplishing the trainer requirements analysis. This list is provided as information to the acquisition manager and is not all-inclusive. See MIL-HDBK-29612-2 for additional guidance. Efforts include:

a. Identify the media selection model to be used.
b. Determine the media selection/allocation process to be used.
c. Determine the sensory stimulus requirements (e.g., motion, color, sound, etc.) needed to support the learning objectives.
d. Match the sensory stimulus requirements to the media features.
e. Determine the most cost-effective trainer system that supports the training requirement.
f. Determine the trainer system functional characteristics required to support the training requirement.
g. Determine the trainer system support requirements.

4.2.2 Trainer TEMP. The TEMP should be initiated as soon as practicable in the acquisition process, prior to promulgation of any trainer RFP. It is the plan for test and evaluation and is a

dynamic document. The content will need to be continually modified and expanded as the program moves through the development and production phases. DoD 5000.2-R provides the content and format requirements for a formal TEMP as used in major procurements.

4.2.3 Acquisition strategy. The acquisition strategy document is a contract between the acquisition program manager and the Milestone Decision Authority (MDA) on the strategy to be used in developing and procuring trainers. This document is prepared by the acquisition program manager with support from their Integrated Product Teams (IPT) and coordinated with the Acquisition Coordination Team (ACT). This document will subsequently serve as the basis for the Acquisition Plan. Refer to DoD 5000.2-R for additional information.

4.2.4 Acquisition plan. The acquisition plan documents a brief history of the training requirement, the acquisition strategy decisions, and milestones for completion of major steps in the procurement process. Acquisition planning is documented in either a formal acquisition plan or a program management plan, depending on the acquisition value, complexity, and agency requirements. Agency directives define program management plans. Formal acquisition plans in accordance with DoD 5000.2-R are applied only to more complex and costly acquisitions. Whether a formal acquisition plan or a program management plan is used, their purpose is the same.

4.2.5 Use of Contractor Furnished Equipment (CFE)/Government Furnished Equipment (GFE). Common operational equipment used in trainers is classified as either CFE or GFE. CFE is equipment developed by the prime manufacturer, or one of their vendors, for installation in, or support of, a production system/equipment. CFE procured by the Government for spares and other purposes is brought directly into the inventory as Government equipment. GFE is Government equipment or components procured by the Government and provided to a contractor or other activity for a specified purpose. Historically, unavailability of properly configured weapon system common equipment has been second only to the lack of accurate, timely data as a risk factor in trainer development. Typical consequences resulting from shortages of operational equipment include schedule slippages, design/performance problems (caused by the use of prototype vice production units), and cost overruns. Advanced planning and close monitoring are required to ensure that the operational equipment required for trainer development can be made available, when needed. This process, which starts by addressing these equipments in the risk assessment program and the development of an acquisition strategy that will maximize the chances for successful trainer development.

4.2.5.1 Tasks associated with identifying CFE/GFE requirements. The following provides guidance for determining the use of CFE/GFE in trainer development:

a. Identify the core Manpower, Personnel, and Training (MPT) IPT personnel and other Subject Matter Experts (SME) needed to determine weapon system common operational

equipments/components that should be used in the trainer. Personnel who are familiar with the weapon system (e.g., engineers, test and evaluation personnel, contractors, etc.) are potential sources for SMEs. These SMEs are essential for any developmental program. It is noted that if the trainers are to be procured through the prime, the following tasks should be joint Government and contractor IPT efforts.

b. Convene the MPT IPT and ensure all members have access to all applicable program documentation.
c. Develop a candidate list of operational equipment for possible use in each trainer. For a new weapon system, review the equipment item-by-item using the following guidelines. The overriding consideration is the probable impact that the use of this equipment will have on trainer cost, schedule, and performance. Specific factors to be evaluated include design maturity (i.e., developmental or existing), availability, procurement lead-time, cost, functional characteristics, impact on trainer fidelity, reliability, and maintainability. The comparative life cycle cost of updating a trainer employing stimulated operational equipment versus the cost and time of updating simulated equipment must weigh heavily in these decisions.
d. Analyze each item of candidate equipment and determine if CFE or GFE should be utilized. Assuming the trainers are being procured through the prime, in general, the procedure for supplying operational equipment for use in trainers should parallel the procedure used for the weapon system. That is, if an item is CFE to the weapon system it should be CFE to the trainer. If the Government provides GFE to the prime for installation in the weapon system, GFE should also be provided for the trainer. Situations may arise, however, where exceptions to this guideline may be prudent.
e. Develop a plan for the rapid repair/replacement of CFE/GFE provided to the trainer manufacturer. Include provisions for maintaining configuration as design changes occur.

4.2.5.2 CFE/GFE lessons learned. Experience has shown that when weapon system common equipment is provided as GFE to the trainer manufacturer, particularly on competitive breakout contracts direct to trainer industry, some type of claim against the Government for late, defective, or improperly configured GFE occurs in a significant number of procurements. Shifting the responsibility to the trainer contractor by making these items "Contractor Acquired Operational Equipment" may reduce Government liability (in some, but not all cases). However, it usually does not resolve the basic problem that occurs when the Government cannot obtain this equipment, a trainer manufacturer with far less leverage has little chance of success. As a result, the Government still does not get a properly configured, on-time trainer.

4.2.5.2.1 Start early. Failure to identify trainer operational equipment requirements in a timely fashion can result in trainer designs that use simulation as the only option. Do not delay this identification process while awaiting sufficient data. Start early and prepare a preliminary candidate list that can be reviewed and updated throughout the proposal and specification process. Malfunctions in CFE/GFE provided to a trainer contractor will invariably result in cost

and schedule problems unless a responsive replacement program for defective equipment is established.

4.3 RFP preparation. An RFP can be prepared with a SOO or a SOW. The following paragraphs provide general guidance for the preparation of an RFP with a SOO or SOW. The SOO is how the Government requires the offeror to submit a SOW and DD Form 1423, Contract Data Requirements List (CDRL) as part of the proposal. When a SOO is not used, the Government will submit a SOW and CDRL(s) as part of the RFP. See MIL-HDBK-245 for additional guidance on the development of SOOs and SOWs.

4.3.1 Considerations for the RFP preparer(s). The acquisition manager should form an IPT and select an IPT leader who is experienced in acquisition and RFP development. The IPT leader should include team members who are experienced in areas such as acquisition, engineering, training, and contracts. Depending upon the scope of the RFP objectives, specific personnel such as SMEs, cost analysts, etc., may be assigned to the team. The IPT should develop the RFP keeping the following principles in mind at all times:

a. State requirements in terms of trainer performance requirements instead of specifying a process.
b. Invoke specifications and standards only when necessary. If invoked, explicitly define the part, section, or paragraph applicable to the procurement.
c. Cite only the minimal applicable performance requirements of MIL-PRF-TRNRS, in whole or in part. Tailoring will limit cost drivers. Selectively invoke other documents only to the extent required to satisfy the existing requirements.
d. Cite verification requirements that the Government will impose on the offeror.
e. Clearly state in the RFP what criteria will be used in evaluating proposals. The writer of the RFP must create specific measurable proposal evaluation criteria to fit the trainer acquisition. The criteria should be stated in "Section M - Evaluation Factors For Award" of the RFP.

4.3.2 SOO concept. The SOO is a Government prepared document that is incorporated into the RFP; it states the overall RFP objectives. It is provided in the RFP instead of a Government written SOW. The SOO can be used to provide the maximum flexibility to each offeror to propose an innovative development approach to satisfy the objectives. Offerors use the RFP, product performance requirements, and SOO as a basis for preparing their proposals which will include a SOW and CDRL(s). NOTE: The SOO is not retained as a contract compliance item.

4.3.2.1 SOO content. SOOs contain brief statements, and average 2-4 pages in length. Contract Schedules, Sections L and M should follow with instructions to the offerors requesting proposal information supporting the Government’s objectives, and evaluation criteria that clearly identifies how the offeror's responses will be evaluated. Each part of the RFP must support every

other part. The key is to keep the SOO clear and concise and to provide potential offerors with enough information to structure a sound program, designed to be executable and satisfy Government objectives. The SOO is used, along with other information and instructions in the RFP, by offerors to develop the SOW and other documents supporting and defining the offerors' proposed effort. The SOO may be listed in Section J, attached at the end of the RFP, or referenced in Section L and/or Section M and attached as an annex. Alternatively, the SOO may be placed in Section L of the RFP. The placement of the SOO within the RFP is a decision to be made by the procuring activity. At contract award, the SOO is replaced in the contract by the SOW.

4.3.2.2 SOO development approach. A systematic process is essential for SOO development. The following steps are an integral part of that process:

a. Conduct market research to determine whether commercial items or non-developmental items are available to meet program requirements.
b. Review the requirement documents that establish the need for the trainer.
c. Review the various DoD/Services/Joint Services requirements documents for program management, acquisition, and control impact.
d. Prepare a bibliography citing the specific portions of all applicable governing instructions, directives, specifications, and standards with which the program must comply. Keep these requirements to the absolute minimum.
e. Establish top-level program objectives for the procurement.
f. Identify the Government’s minimum data requirements for the trainer.
g. State the evaluation criteria that will be used to evaluate the proposals.
h. Provide instructions to the offeror to include requiring the offeror to use the SOO to construct and submit a SOW and CDRL. Stress the importance of the evaluation of the SOW and CDRL(s) as they are critical elements in assessing the offeror's understanding of both required goods/services, and work effort required to accomplish them.

4.3.2.3 RFP/SOO guidance.

a. Section L of the RFP must include instructions to the offeror that require using the SOO to construct and submit a SOW and CDRL(s). An example of such wording for Section L follows:

"The Statement Of Objectives (SOO), included as (cite location of SOO in the RFP), provides the Government’s overall objectives for this RFP. Offerors shall use the SOO, together with other applicable portions of this RFP, as the basis for preparing their proposal, including the Contract Work Breakdown Structure (CWBS), SOW, and CDRL(s). The offeror shall ensure all aspects of the SOO are addressed. The SOW should specify in clear, understandable terms the work to be done in developing or producing the goods to be delivered or services to be

performed by the contractor. Preparation of an effective SOW requires both an understanding of the goods or services that are needed to satisfy the requirement and an ability to define what is required in specific, performance-based, quantitative terms. The offeror's understanding of both required goods/services, and work effort required to accomplish should be fully demonstrated in the offeror's proposed CWBS, SOW, and CDRL(s)." (End of Section L example wording.)

b. Section M of the RFP must include evaluation factors for award and should include sufficient criteria to:

(1) Evaluate the offeror's ability to successfully achieve the SOO objectives.
(2) Ensure a sound approach is proposed in the offeror's SOW.
(3) Verify that all requirements can be met.
(4) Place emphasis on the Government's intention to evaluate the SOW in both Section L and Section M. Evaluate the offeror's proposed CWBS, SOW, and CDRL(s) in assessing the offeror's understanding of both required goods/services, and work effort required to accomplish them.

4.3.3 Statement Of Work. The SOW may be prepared by either the Government or the offeror. The SOW should only be used in an RFP in those cases where exact performance requirements or work effort is needed. An offeror submits a proposal based on their perception of the Government's needs as defined in the RFP, product performance requirements, SOW, and CDRL(s). MIL-HDBK-245 provides detailed guidance in the preparation of SOWs.

4.3.3.1 Purpose of the SOW. The SOW and the trainer design specification serves as the standard for determining if the contractor meets the stated performance requirements. The SOW should specify in clear, understandable terms the work to be performed in developing or producing the goods to be delivered or services to be performed by a contractor. Precisely stated requirements will assist the offeror and the Government in negotiating a fair price for the deliverables and/or services to be provided. Ensure the SOW does not include requirements already stated in a specification. Preparation of an effective SOW requires both an understanding of the goods or services that are needed to satisfy a particular requirement and an ability to define what is required in specific performance-based quantitative terms. The SOW also aids the Government in source selection and contract administration after award.

4.3.3.2 Relationship between the SOW and MIL-PRF-TRNRS. The SOW defines, either directly or by reference to other documents, all work tasks required of the contractor. MIL-PRF-TRNRS contains specific measurable performance requirements and evaluation criteria for trainers. The SOW may reference MIL-PRF-TRNRS when defining performance requirements for trainers.

4.3.3.3 Relationship between the SOW and contract. A SOW serves as the basis for successful performance by the contractor and is used by the Government to determine if the contractor completes the work tasks stated in the contract. It is also used for effective administration of the contract by the Government.

4.3.3.4 Relationship between the SOW and contractor performance. After contractor selection and contract award, the contract SOW becomes a standard for measuring contractor performance. Consequently, the SOW writer needs to consider the contractual and legal implications of the SOW during its preparation. As the contracted effort progresses, the Government and the contractor will refer to the SOW to determine their respective rights and obligations. In this respect, the SOW defines the contract and is subject to the interpretations of contract law. The SOW must clearly define the work to be performed, since the language detailing the contractor's effort may be pertinent to legal questions concerning the scope of work. In a dispute concerning performance, rights, or obligations, clearly defined requirements will enhance the legal enforceability of a SOW.

4.3.3.5 Relationship of the SOW to the CDRL and DID. The SOW establishes a specific work requirement. The associated CDRL orders a data product and identifies due date(s), frequency for submission, distribution, tailoring requirements, etc. The DID provides the format and content requirements for a particular data product, with non-essential data requirements tailored out of the DID as noted in the CDRL.

4.3.4 Performance requirements in the RFP. It is necessary to include trainer performance requirements in RFPs. RFPs will state, in performance terms, what is required of each trainer. The RFP should also state the intended use, life cycle maintenance requirements, necessary interfaces, and training environment for each trainer. The offerors are free to propose any method for meeting the performance requirements. Offerors may propose alternatives, such as Commercial and Non-Developmental Items (CaNDI) or entirely new products, as long as the proposed products meet the performance criteria stated in the RFP. The crucial issue is that both offerors and acquisition managers need to be able to determine whether the trainer meets the performance criteria.

4.3.5 Trainer performance requirements guidance. Section 3 of MIL-PRF-TRNRS, contains performance requirements for trainer hardware and software, and Section 4 contains trainer verification criteria. Both the performance requirements and verification criteria may be cited in an RFP or a contract (it is not mandatory). If MIL-PRF-TRNRS is not cited, then alternative trainer performance and verification criteria requirements must be developed and provided in its place. The content and format of the RFP package is flexible and should only include essential Government requirements. The RFP package will reflect the adequacy and accuracy of the requirements. Considerable risk may be placed on the Government and contractor when the RFP package lacks adequate definition of requirements. RFP packages should require an integrated

Government and contractor Quality Assurance (QA) process. Joint quality reviews, as part of the IPT process, are important. A well-written RFP package defines these QA procedures. This, in turn, should reduce technical, schedule, and cost risks for both the contractor and the Government.

4.3.5.1 Tailoring trainer performance requirements. Acquisition managers should tailor trainer requirements specified in MIL-PRF-TRNRS to ensure that unnecessary trainer hardware and software are not procured. This tailoring process should result in a clear understanding by the Government and the contractor of what is required, and the specific measurable criteria by which the trainer is to be examined and evaluated. MIL-PRF-TRNRS may be tailored by modifying, adding, or deleting performance requirements and verification criteria.

4.3.6 Data requirements. Data (e.g., reports, lists, manuals, publications, etc.) requirements are needed to support the development, operation, and maintenance of trainers and training equipment. Additional data may be required to provide the training syllabus that supports the instructional intent of the trainer. Section 5 provides detailed guidance for the acquisition of data requirements for trainers.

4.3.6.1 Tailoring data requirements. When procuring a trainer, it is necessary to determine which DIDs provide the trainer data requirements. When the appropriate DIDs have been determined, each should be carefully reviewed to identify the minimum requirements. DIDs should be tailored so that only the required trainer data is procured. DIDs are tailored by deletion only. Deletion tailoring is performed by annotating in Block 16 of the CDRL the DID paragraph(s) which are not required. See MIL-HDBK-245, Section 5 for detailed information.

4.3.6.2 Other data requirements. The Government needs to stay apprised of the contractor's progress during the development of the trainer. The Government also needs to receive data on a periodic basis related to the reliability and maintainability of the trainer. Most of this data can be procured by citing the requirement for various technical reports in the SOW. Selectively eliminating unnecessary reports and requiring appropriately phased submissions can minimize data costs. A DID for a technical report (i.e., DI-MISC-80508) will suffice in most cases if the Government specifies the minimum data required by the Government in the SOW and CDRL(s). The contractor’s format may be acceptable for submission of trainer data requirements, if so this should be annotated in block 16 of the CDRL. The source for researching DIDs is the DoD 5010.12-L, Acquisition Management Systems and Data Requirements Control List (AMSDL). Section 5, paragraph 5.3.10 of this handbook contains information on data (e.g., reports, lists, manuals, publications, etc.) that the Government may want to have submitted periodically to support the development, operation, and maintenance of the trainer.

5. DETAILED GUIDANCE FOR TRAINER ACQUISITION

5.1 Detailed guidance. This section provides information and guidance for the preparation of trainer RFPs. This guidance is applicable to both the SOO and SOW methods for an RFP.

5.2 SOO development. The SOO should provide the basic, top-level objectives of the acquisition. This approach provides potential offerors the flexibility to develop cost-effective solutions and the opportunity to propose innovative alternatives meeting the stated objectives. It also presents the Government with an opportunity to assess the offeror's understanding of all aspects of the effort to be performed. For an example of a notional SOO, see Figure 1.

STATEMENT OF OBJECTIVES (SOO) FOR THE _____TRAINER

1.0 PROGRAM OBJECTIVES.

1.1 Background. This will be a Joint Service procurement. The U.S. Army, Navy, and Marine Corps have a need to replace the aging _____ pilot training flight simulators to reduce the time and cost to train, and increase the scope of ground training. The current _____ pilot training simulators are capable of supporting normal and emergency flight operations, and navigation training.

1.2 Operational capability. The objectives for this procurement are to provide military personnel who have basic helicopter pilot knowledge and skills with the capability to operate the _____helicopter under normal and emergency operations to include:

a. Capability to train throughout the helicopter flight envelope.
b. Instruments and navigation training.
c. Complete mission rehearsal training.

1.3 Operational features. Operational capabilities of the _____ helicopter flight simulator must include:

a. A cockpit environment that replicates the _____cockpit.
b. Situational awareness cues that stimulate the pilot's senses to detect motion that is representative of cues provided by the helicopter when flying.
c. Visual cues that are representative of the external flight environment to include terrain, weather, and opposing forces.
d. Distributed mission simulation that supports battle force training.

2.0 CONTRACT OBJECTIVES.

2.1 Trainers. The contractual objectives for trainers include:

a. The offeror's trainer development approach will result in production of one (1) prototype and 24 production trainers that satisfy the operational capability and features noted above within a five (5)-year period.
b. The offeror's approach to the use of technology will increase training capability and reduce time and cost to train.

NOTE: This sample is not meant to be representative of an actual Government requirement. It is incomplete and is provided only as an example of a SOO format.

FIGURE 1. **Sample SOO format.**

5.3 SOW development. The guidance contained in this section includes the application, tailoring, and interfaces among MIL-PRF-TRNRS, MIL-PRF-29612, related DIDs, and an RFP. The guidance contained in this section should be selectively applied depending on the scope of the procurement and trainer performance needs.

5.3.1 Source data. Prior to developing a SOW, the acquisition manager will need to collect data. There are two (2) sources for data that can serve as the baseline for trainer performance requirements. A needs analysis should have been completed prior to RFP initiation. This needs analysis results in documentation that serves as the baseline for training media performance requirements. Also, MIL-PRF-29612, paragraph 3.2.3 and DI-SESS-81519 provide requirements for functional characteristics data that can serve as the baseline for trainer performance requirements. If functional characteristics data has not been provided, it may be necessary to include MIL-PRF-29612, paragraph 3.2.3 in the trainer SOW. For additional data requirements, see paragraph 5.3.10 in this handbook.

5.3.2 Trainer requirements. Trainers should support instruction for operators and maintainers applicable to related end items. The RFP should state the following:

a. Interface requirements.
b. Functional performance requirements.
c. Physical performance requirements.
d. Reliability and maintainability requirements.
e. Support requirements.
f. Data requirements.

5.3.2.1 Trainer functional performance requirements. Trainer performance should provide, to the fullest extent possible, sensory stimulus necessary to support effective transfer of knowledge and skills. The trainer should stimulate the student's senses (e.g., sight, touch, smell, hearing, etc.) to cause the appropriate student response. Trainer functional performance requirements are satisfied through the use of realism, replication, representation, cues, stimuli, simulation, animation stimulators, interaction, and pacing. Detailed requirements contained in the functional characteristics baseline data should be analyzed to determine trainer feature requirements to be included in the SOW. The features should provide the realism required to support student achievement of the learning objectives. Trainer functional performance requirements are provided in MIL-PRF-TRNRS, paragraph 3.1.

5.3.2.2 Trainer system reviews and audits. It is necessary to include a requirement in the SOW for reviews and audits, as the system design of a trainer needs to be followed closely by both the contractor and the Government throughout the entire construction process. The products/documents, follow-on updates, and Government participation (approval) should be in

accordance with the Standard for Information Technology Software Life Cycle Processes (IEEE 12207.0). All proposed changes are subject to review and approval by the Government, therefore the contractor should notify the Government of proposed changes to the Software Design Document, prior to making any revisions. ANSI/EIA 649 provides guidance on configuration and baseline management. The contractor will normally conduct numerous reviews and audits prior to and during the construction process. These are listed below:

a. System Requirements Review (SRR).
b. Software Specification Review (SSR).
c. Preliminary Design Review (PDR).
d. Critical Design Review (CDR).
e. Test Readiness Review (TRR).
f. Functional Configuration Audit (FCA).
g. Physical Configuration Audit (PCA).

5.3.3 Trainer requirements. Trainers should be constructed to represent the operation of the actual end item to the degree required to support achievement of the learning objectives. Trainer requirements are provided in MIL-PRF-TRNRS, Section 3.

5.3.3.1 Trainer features requirements guidance. The trainer performance requirements contained in MIL-PRF-TRNRS covers a wide spectrum of trainer features to support many trainer designs, from the most simple (component cutaway) to very complex (weapon systems trainer with motion and visual system). The physical features and functions should be tailored to the specific need. Table 1 provides a job aid for tailoring MIL-PRF-TRNRS for applicability to the specific trainer acquisition. These physical and functional features are described in the paragraphs that follow Table 1. Additional physical features and functions that are beyond the scope of those selected from Table 1 may be added as required. MIL-PRF-TRNRS requirements may be deleted, added, or altered by defining those changes in the SOW.

TABLE 1. **Checklist for tailoring trainer features in the SOW.**

REQUIREMENT	**INCLUDE IN SOW?**		**APPLICABLE MIL-PRF-TRNRS PARAGRAPH**
	YES	**NO**	
TRAINER FUNCTIONAL PERFORMANCE REQUIREMENTS			3.1.3
Visual stimuli performance requirements			3.1.3.1
• Visual scale			3.1.3.1.a
• Visual color			3.1.3.1.b

TABLE 1. **Checklist for tailoring trainer features in the SOW - Continued.**

REQUIREMENT	INCLUDE IN SOW?		APPLICABLE MIL-PRF-TRNRS PARAGRAPH
	YES	NO	
• Visual movement			3.1.3.1.c
• Visual texture			3.1.3.1.d
Tactile stimuli performance requirements			3.1.3.2
• Tactile resistance			3.1.3.2.a
• Tactile shape			3.1.3.2.b
• Tactile size			3.1.3.2.c
• Tactile temperature			3.1.3.2.d
• Tactile texture			3.1.3.2.e
• Tactile movement			3.1.3.2.f
Olfactory stimuli performance requirements			3.1.3.3
• Olfactory fragrance and odor			3.1.3.3.a
• Olfactory taste			3.1.3.3.b
Auditory stimuli performance requirements			3.1.3.4
• Auditory duration			3.1.3.4.a
• Auditory pitch			3.1.3.4.b
• Auditory rate			3.1.3.4.c
• Auditory sound and sound level			3.1.3.4.d
Simulation			3.1.4
• Simulation of functions and environment			3.1.4.1
• Simulation of normal operations and malfunctions			3.1.4.2
Animations			3.1.5
Animated electromechanical physical objects			3.1.6
Stimulator			3.1.7
Interaction			3.1.8
Pacing			3.1.9
TRAINER INTERFACE			3.2.1
Instructor-equipment interface			3.2.1.1
Student-equipment interface			3.2.1.2
Instructor-student interface			3.2.1.3
Trainer-trainer-military organization equipment interface			3.2.1.4

TABLE 1. **Checklist for tailoring trainer features in the SOW - Continued.**

REQUIREMENT	INCLUDE IN SOW?		APPLICABLE MIL-PRF-TRNRS PARAGRAPH
	YES	NO	
TRAINER PHYSICAL FEATURES			3.2.2
Input and output signals			3.2.2.1
Electrical power supply			3.2.2.2
Hydraulic and pneumatic power supply			3.2.2.3
Fluids			3.2.2.4
Gases			3.2.2.5
Materials			3.2.2.6
• Flammable materials			3.2.2.6.1
• Fungus inert materials			3.2.2.6.2
• Hazardous materials			3.2.2.6.3
• Ozone Depleting Substances (ODS)			3.2.2.6.4
• Metal			3.2.2.6.5
• Wood products			3.2.2.6.6
• Radioactive material			3.2.2.6.7
• Recycled, virgin, and reclaimed materials			3.2.2.6.8
Electronic transmissions			3.2.2.6.9
• Electromagnetic Interference (EMI)			3.2.2.6.9.1
• Electromagnetic radiation			3.2.2.6.9.2
• Electrostatic Discharge (ESD)			3.2.2.6.9.3
• TEMPEST			3.2.2.6.9.4
Parts			3.2.2.7
Components			3.2.2.8
• Prototype and pre-production equipment			3.2.2.8.1
• Rejected and non-operable parts			3.2.2.8.2
• Modification of operable system components			3.2.2.8.3
• Modification of Government Furnished Equipment (GFE)			3.2.2.8.4
• Cutaway and plasticized components			3.2.2.8.5
• Identical units			3.2.2.8.6
• Special controls			3.2.2.8.7
• Attachment of components			3.2.2.8.8

TABLE 1. **Checklist for tailoring trainer features in the SOW - Continued.**

REQUIREMENT	INCLUDE IN SOW?		APPLICABLE MIL-PRF-TRNRS PARAGRAPH
	YES	NO	
Sectionalized units			3.2.2.9
Fasteners			3.2.2.10
Finish and protective coating			3.2.2.11
• Painting, and preparation for			3.2.2.11.1
• Nonskid surfaces			3.2.2.11.2
• Sealing of porous structural materials			3.2.2.11.3
• Cleaning, painting, plating, anodized films, and chemical treatments			3.2.2.11.4
Panel plumbing			3.2.2.12
Antennas, dummy loads, and absorption enclosures			3.2.2.13
Power distribution			3.2.2.14
• Power-line monitoring/protection			3.2.2.14.1
• Under/overvoltage			3.2.2.14.2
• Voltage transients			3.2.2.14.3
• Phase rotation			3.2.2.14.4
• Under-frequency			3.2.2.14.5
• Frequency transients			3.2.2.14.6
• Power interruption			3.2.2.14.7
Elapsed time meters			3.2.2.15
Malfunction control subassembly			3.2.2.16
Wiring			3.2.2.17
• Wire bundling			3.2.2.17.1
• Grounding			3.2.2.17.2
• Insulation protection			3.2.2.17.3
• Terminal strips			3.2.2.17.4
• Live and spare conductors			3.2.2.17.5
• Potting			3.2.2.17.6
• Solderless electrical connections and soldered joints			3.2.2.17.7
• Optical fiber cables and raceways			3.2.2.17.8
Relays			3.2.2.18

TABLE 1. **Checklist for tailoring trainer features in the SOW - Continued.**

REQUIREMENT	INCLUDE IN SOW?		APPLICABLE MIL-PRF-TRNRS PARAGRAPH
	YES	NO	
Power supplies			3.2.2.19
• Output power density			3.2.2.19.1
• Power supply derating criteria			3.2.2.19.2
Microelectronic and thin film devices			3.2.2.20
• Compatibility			3.2.2.20.1
• Heat dissipation			3.2.2.20.2
• Shielding			3.2.2.20.3
• Plug-in modules			3.2.2.20.4
Hydraulic and pneumatic power hoses			3.2.2.21
Simulations			3.2.2.22
Animations			3.2.2.23
Animated electromechanical physical objects			3.2.2.24
Human factors engineering requirements			3.2.2.25
Lasers			3.2.2.26
Data plates, identification plates, and other marking			3.2.2.27
• Data plates			3.2.2.27.1
• Identification plates for units, assemblies, subassemblies, and components			3.2.2.27.2
• Marking of sectionalized units			3.2.2.27.3
• Marking of plug-in assemblies			3.2.2.27.4
• Marking of fuse holders			3.2.2.27.5
• Marking of controls and indicating devices			3.2.2.27.6
• Marking of sockets			3.2.2.27.7
• Marking of printed wiring boards			3.2.2.27.8
• Marking of terminals, terminal blocks, and strips			3.2.2.27.9
• Marking of fluid and gaseous transmission lines			3.2.2.27.10
• Marking of fluid tanks and reservoirs			3.2.2.27.11
• Marking of reference designators			3.2.2.27.12
• Marking of cable and wires			3.2.2.27.12.1

TABLE 1. **Checklist for tailoring trainer features in the SOW - Continued.**

REQUIREMENT	INCLUDE IN SOW?		APPLICABLE MIL-PRF-TRNRS PARAGRAPH
	YES	NO	
• Marking of cables			3.2.2.27.12.2
• Marking of disconnectable cables			3.2.2.27.12.3
• Marking of "W" and "P" cable designations			3.2.2.27.12.3.1
• Marking of to-from designators			3.2.2.27.12.3.2
• Marking of assembly/part number			3.2.2.27.12.3.3
• Marking of optical fiber cables			3.2.2.27.13
• Marking of electrical power requirements			3.2.2.27.14
• Marking of trainer with modified, rejected, or non-operable parts			3.2.2.27.15
• Marking of parts that are modified, rejected, or non-operable			3.2.2.27.16
• Marking of safety hazards			3.2.2.27.17
• Marking of power switch warning plates			3.2.2.27.18
• Marking of emergency power control switch			3.2.2.27.19
• Marking of Electrostatic Discharge (ESD) assemblies			3.2.2.27.20
• Marking of ESD sensitive assemblies			3.2.2.27.20.1
• Marking of ESD sensitive equipment			3.2.2.27.20.2
• Marking of external equipment terminals			3.2.2.27.20.3
• Marking of security cover			3.2.2.27.21
• Marking of hard cover			3.2.2.27.22
• Marking of lifting instructions for heavy trainers			3.2.2.27.23
• Marking center of balance			3.2.2.27.24
Safety requirements			3.2.2.28
• Warning sign			3.2.2.28.1
• Warning lights			3.2.2.28.2
• Auditory sound level			3.2.2.28.3
• Temperature sensing alarms			3.2.2.28.4
• Equipment energized from multiple power sources			3.2.2.28.5

TABLE 1. **Checklist for tailoring trainer features in the SOW - Continued.**

REQUIREMENT	INCLUDE IN SOW?		APPLICABLE MIL-PRF-TRNRS PARAGRAPH
	YES	NO	
• Emergency equipment power disconnect			3.2.2.28.6
• Raised surfaces			3.2.2.28.7
Workmanship			3.2.2.29
• Cleaning			3.2.2.29.1
• Threaded fasteners			3.2.2.29.2
• Wiring			3.2.2.29.3
• Shielding on wires and cables			3.2.2.29.4
Modifications, changes, and configuration control			3.2.2.30
Structural integrity			3.2.2.31
• Welded joints			3.2.2.31.1

5.3.3.2 Trainer physical and functional features descriptions. Trainer physical and functional features should be designed to stimulate visual, tactile, olfactory, and auditory senses. Trainers can be procured with hardware or hardware and software features that provide sensory stimuli that will cue a student response to meet the learning objectives.

5.3.3.3 Simulation. Simulations must comply with the requirements stated in the High Level Architecture (HLA). Trainers can perform the following simulations:

a. Simulation of functions and environment.
b. Simulation of normal operations and malfunctions.

5.3.3.4 Animations. The trainer visual subsystem should provide an illusion of movement by displaying a series of successive images that appear to be continuously moving, without flicker. To provide for future reusability, animations should be scaleable and adaptable for various applications. When procuring animations, specify that they must comply with the requirements stated in MIL-PRF-29612 and the Sharable Content Object Reference Model (SCORM).

5.3.3.5 Animated electromechanical physical objects. Animated electromechanical physical objects can be useful for the student to achieve mastery of the learning objective. Examples are as follows:

a. Panel type (i.e., 2-D or 3-D) trainer. Enhances the understanding of a component, system, process, or system operation.

b. Animatronics. Provides practice to facilitate the mastery of a learning objective that requires active interaction with an animated three-dimensional model of a living thing.
c. Mission and scenario related animations. Provides practice to facilitate the mastery of a learning objective that requires active interaction with multiple animated three-dimensional models.

5.3.3.6 Stimulator. The trainer can be interconnected with military organizational equipment to artificially create conditions that reproduce the sensory cues encountered in the operational environment. Stimulation is useful when teaching troubleshooting procedures. Additionally, stimulators may be more cost effective then other forms of training.

5.3.3.7 Interaction. The trainer can provide the following types of functional interaction:

a. Trainer controlled.
b. Instructor controlled.
c. Student controlled.

5.3.3.8 Pacing. The trainer can pace interactions to facilitate the mastery of the learning objectives to include:

a. Real time.
b. Less than real time.
c. Greater than real time.
d. Variable time.

5.3.3.9 Trainer interface requirements. Trainers and associated software may require an interface to fully support the transfer of knowledge and skills. Interface modes should be selected based on the results of the instructional delivery system functional characteristics analysis. Trainer interface modes include:

a. Instructor-equipment interface.
b. Student-equipment interface.
c. Instructor-student interface.
d. Trainer-trainer-military organizational equipment interface.

5.3.3.10 Trainer physical features. Guidance for trainer physical features is as follows:

5.3.3.10.1 Input and output signals. Trainer input and output signals should be representative of the full range of variations encountered on the related end item. The input and output signals of a trainer should be capable of supporting instruction applicable to the related end item.

5.3.3.10.2 Electrical power supply. Trainer electrical power requirements should be built to support the requirements of the installed electrical and electronic system. Trainer electrical systems that are being constructed for use outside the Continental United States (CONUS) should be capable of operating from the power sources of the host country. Trainers or subsystems procured by DoD for support of the North Atlantic Treaty Organization (NATO) must comply with NATO standardization agreements (STANAGS). In the event the trainer is not new construction and is being modified or a trainer is being moved to a new location, power conversion units may be necessary to convert and meet voltage and frequency requirements. Power requirements may originate from facility input power, facility built-in power distribution systems, trainers, and other related Support Equipment (SE).

5.3.3.10.3 Hydraulic and pneumatic power supply. Hydraulic and pneumatic power supplies are constructed to support the mechanical components, functions, and operations of the trainer. These functions are usually movement of landing gear, flight control surfaces, steering mechanisms, etc. Hydraulic and pneumatic power supplies normally duplicate the actual end item pressures unless otherwise specified in the detail specification. During construction, any section of tubing that becomes crimped or damaged can create a safety hazard to personnel due to the high system pressures (the crimped or damaged area becomes a potential rupture point). For trainer maintenance and inspections, a means for depressurizing the system prior to disassembly should be installed.

5.3.3.10.3.1 Hydraulic and pneumatic system protective devices. Hydraulic and pneumatic systems are built with pressure sensing and relief systems (e.g., pressure and warning switches, pressure gauges, bypass and relief valves, etc.). In the event of a system malfunction, a warning indication to the instructor or student should be installed for corrective action or an emergency shutdown. Failure to recognize and react to a malfunction can cause injury to personnel or damage to the trainer. Protective devices used on trainers with motion capability should operate within the limits specified in the contract while the trainer is in any position or rotation about its principal axis (with power applied).

5.3.3.10.4 Fluids. When contracting for a trainer that requires fluids, the fluids used in trainers should have characteristics representative of those used in the related end item.

5.3.3.10.5 Gases. For gases used in trainers, (e.g., CO_2, O_2, breathable air, nitrogen, tear gas, etc.) it may be advisable or even necessary to specify that color and odor be added to aid in identification.

5.3.3.10.6 Materials. Materials used in the construction of trainers need to be compatible with the trainers intended environment as well as the duration of its service life. MIL-HDBK-470 provides guidance on materials selection. Some considerations for materials usage are as follows:

a. Flammable materials. Materials used should be of a noncombustible or fire retardant form (nonpermanent fire retardant additives will not be used to attempt fire retardation). Use of flammable materials in the construction process requires written authorization by the Government.
b. Fungus inert materials. If the prospective environment is conducive for fungus growth, then during construction, consideration for preventing this type of corrosion is required. Environments susceptible to fungus growth are normally high humidity areas. However, the moisture does not have to come from outside if the facilities supporting the trainer are in need of repair (for example, leaking pipes can create a humid environment). Not preserving or sealing the trainer properly will allow the fungus to imbed itself within the structure in turn weakening the overall structure over time.
c. Hazardous materials. Consideration needs to be placed on what type of hazardous materials will be required to construct and operate the trainer (the use of hazardous materials requires Government authorization). The detail specification should define exposure limits for personnel and the environment regarding levels of toxic, carcinogenic, teratogenic, and other hazardous materials. These exposure limits should be based on Occupational Safety and Health Administration (OSHA) and Environmental Protection Agency (EPA) requirements.
d. Ozone Depleting Substances (ODS). Every attempt to avoid use of substances classified as Class I and Class II ODS should be pursued. However, if the use of Class I ODS cannot be avoided, Government approval is required.
e. Metal. Metals should be corrosion-resistant, or metallurgically processed or coated to resist corrosion.
f. Wood products. Wood products should be treated for preservation, fire-retardation, and termite protection, and should conform to commercial Grade B or better.
g. Radioactive material. The use of radioactive materials is prohibited unless specifically authorized in writing by the Government.
h. Recycled, virgin, and reclaimed materials. There is no exclusion to the use of recycled materials and no requirement that items be manufactured from virgin materials. Reclaimed materials may be used to the maximum extent practicable.
i. Electronic transmissions. When the trainer creates electronic emissions that produce electromagnetic interference (from conducted or radiated Radio Frequency (RF) energy) and could adversely affect system functions or may cause injury to personnel, the following should be addressed in the SOW:

(1) Electromagnetic Interference (EMI).
(2) Electromagnetic radiation.
(3) Electrostatic Discharge (ESD).
(4) TEMPEST.

5.3.3.11 Parts. Parts (e.g., screws, bolts, nuts, etc.) should be acquired from DoD sources. Commercial sources may be used when DoD sources are exhausted. MIL-HDBK-512 provides guidance for parts selection, control, and standardization. The SOW should state that parts must be compatible with the environment of the trainer's intended use and specified service life. Parts should be comprised of Commercial and Non-Developmental Items (CaNDI) to the maximum extent practicable. Trainer Peculiar Equipment (TPE) should be kept to a minimum and be comprised only of parts that have been authorized by the Government in accordance with the parts control program requirements of the contract. The parts control requirement should apply to the production and provisioning of TPE.

5.3.3.12 Components. Components (e.g., gauges, controls, switches, etc.) should be acquired from DoD sources. Commercial sources may be used when DoD sources are exhausted. MIL-HDBK-512 is applicable for the selection, control, and standardization of components.

5.3.3.12.1 Use of non-Ready For Issue (RFI) components, parts, and equipment. On occasion, it may become necessary to utilize components, parts, and equipment that require modification or that are considered non-RFI. These types of components are suitable for use for enhancing the lesson through hands on experience or identifying system components and structure. In addition, uses of these components do not interfere with or deplete the supply system (RFI assets remain available for operational commands). Modified components, parts, or equipment should be annotated in the trainer detail specification with an explanation of the changes made. If non-RFI components, parts, or equipment are used, authorization from the procuring activity should be obtained prior to use. Examples of these types are listed below:

a. Prototype and pre-production equipment.
b. Rejected and non-operable parts.
c. Modified operable system components.
d. Modified GFE.

5.3.3.12.2 Cutaway and plasticized components. Cutaway or plasticized components are used to expose the components internal mechanisms and operation. This process is a valuable tool for emphasizing the system operation. The use of cutaway or plasticized components should be specified in the contract.

5.3.3.12.3 Identical units. Identical units are useful when it is necessary to represent the physical and functional characteristics of the actual end item and subsystems, components, subcomponents, and parts to support the learning objectives.

5.3.3.12.4 Special controls. Special controls (accessible only to the instructor) may be required to operate the trainer that are not a part of the related end item and subsystems and are

not used to control signal simulators. These controls should be grouped in an area not visible to the students.

5.3.3.12.5 Attachment of components. Trainer components and subassemblies should be attached in a manner that permits access to interior parts, terminals, and wiring for maintenance and repair. Additionally, components and associated wiring, fluid lines, and tubing should be attached in positions that do not obstruct the student's view of other components.

5.3.3.13 Sectionalized units. Sectionalized units are main components that can be broken down to individual components for enhancing training. Any component surface that becomes exposed for training purposes through the sectionalization process should not display imperfections. An imperfection (e.g., scoring, tooling marks, etc.) is usually the result of the machining operation. MIL-HDBK-808 and ANSI-A156.18 (BHMA-A156.18) provide guidance on contrasting colors of the mating surfaces for sectionalized surfaces (the surfaces are usually red). In addition, different colors may be used for contrast, or to differentiate between sectionalized mating surfaces or the coloring of the interior of cutaway components, pressures, components, and systems.

5.3.3.14 Fasteners. Trainer fasteners that are used to secure removable components, casters, access doors, and other detachable items should require a minimum number of turns to the locked position commensurate with stress requirements.

5.3.3.15 Finishes and protective coatings. The finish and protective coating is applied to provide the student with equipment reflecting the actual end item and/or subsystem. In addition, this coating and sealing process provides corrosion and moisture resistance for the structure and components. All surfaces requiring painting should be prepared and painted following the recommendations of the paint manufacturer. Class I ODS based solvents should not be used in the preparation process, however, if they are necessary, Government authorization is required. On elevated surfaces (e.g., working platforms, stairs, ladders, etc.) that present a potential slip hazard to personnel, a nonskid paint or material should be applied to those surfaces.

5.3.3.16 Panel plumbing and cabling. Fluid lines, tubing, and cabling should be mounted or routed within the trainer to resemble the end item and/or subsystem. The routing of lines and cabling provides two (2) functions. First, it enhances the learning objective through recognition. When the student returns to their command, they are familiar with the location of systems and components that they will be working with. Second, careful routing of the lines and cabling will prevent chafing or kinking, which in turn reduces maintenance time.

5.3.3.17 Antennas, dummy loads, and absorption enclosures. Antennas, dummy loads, or absorption enclosures that are not the normally approved SE for the system being represented, should be accurately matched to the equipment, and carefully tested by the contractor to ensure

that radiation of RF energy is in accordance with MIL-STD-464. Any substitute antennas provided as replacements for actual antennas should be listed as simulated items in the appropriate trainer descriptions of the detail specification.

5.3.3.18 Power distribution. Power distribution allows for equipment operation within the trainer and/or trainer subassemblies in its intended instructional environment. Trainer operation may be in one location or between multiple locations (e.g., room-room, building-building, etc.). Power distribution considerations include: power-line monitoring/protection, under/overvoltage, voltage transients, phase rotation, under-frequency, frequency transients, and power interruption. Common power distribution components are as follows:

a. Power connections.
b. Electrical power cables.
c. Electrical power interconnection.
d. Electrical power receptacles and connectors.
e. Power control subassembly.
f. Circuit protective devices.
g. Blown fuse indicator light.
h. Emergency power control switch.

5.3.3.19 Elapsed time meters. Elapsed time meters provide a running record of trainer operational use. This is required for the tracking of maintenance and/or inspection cycles. While in the testing phase of the trainer, ensure that any operational time, the time at which a malfunction occurred, or a modification is incorporated is logged into the appropriate logbooks.

5.3.3.20 Malfunction control subassembly. Trainers that simulate operation of a weapon system (i.e., flight simulator, tank simulator, Landing Craft Air Cushion (LCAC)) are sometimes constructed with a malfunction control subassembly. This subassembly allows the instructor to program malfunctions into the training scenario for the student to react to. These subassemblies (normally in the form of a control panel) also provide for scenario control. The instructor can set into the scenario; time of day, weather, combat conditions, and terrain as well as malfunctions.

5.3.3.21 Wiring. Trainer and component wiring (this includes optical fiber cables and raceways) should duplicate the wiring of the end item; this enhances the learning experience for the student. Care needs to be given during the construction and/or assembly process to prevent chafing, stretching, or cutting of the wire and damage to connections. Chafing, stretching, or cutting of the wire creates an electric shock hazard to personnel and/or damage to the trainer and its equipment and reduces the overall life of the wiring. In addition, stretched wiring may be pulled out from the connectors or create shorts from improper connections giving erratic or false indications of equipment status. This situation can increase the time required to isolate the malfunction, increase maintenance costs, reduce the service life of the trainer, and reduce the

amount of training time available for the students. National Fire Protection Agency (NFPA) 70 provides guidance on wiring procedures.

5.3.3.22 Relays. Relays aid in the distribution of electrical and electronic signals. The overall effectiveness of the relays can become drastically reduced from the effects of electromagnetic interference, dust, dirt, overvoltage, etc. As with the wiring of a trainer, improper sealing, installation, and design of relays will result in erratic signals, indications, and performance. Again, these factors will only increase the time to isolate the problem and repair it as well as reduce the training time available for the student.

5.3.3.23 Power supplies. The requirements for the trainer power supply should be specified in the detail specification. Guidance for power supplies is provided in the NFPA 70.

5.3.3.24 Microelectronic and thin film devices. Microelectronic and thin film devices should be made available from at least two (2) sources as replacement parts for the service life of the equipment. The following are subjects to be considered when procuring microelectronic and thin film devices:

a. Compatibility.
b. Heat dissipation.
c. Shielding.
d. Plug-in modules.

5.3.3.25 Hydraulic and pneumatic power hoses. Hydraulic and pneumatic power hoses are rated at specific pressure levels. A line that has too much pressure going through it creates a severe safety hazard to personnel through the possibility of rupturing. Too much pressure in the system can rupture seals or gaskets, and too little pressure can cause the system to cavitate or move in an erratic manner. A system operating with an incorrect pressure can also cause damage to the components of that system.

5.3.3.26 Simulations. Simulations are used to facilitate real-time interactive training. Simulations should be created as closely as possible to represent actual environments and situations to provide an individual or a crew with the opportunity to practice operational tasks in accordance with the training objectives. Simulations must comply with the requirements stated in the HLA.

5.3.3.27 Animation. Animation provides a relatively inexpensive technique to employ a visual understanding of component or system theory and function through depiction of mechanical or non-mechanical movement.

5.3.3.27.1 Animation techniques. The animation can depict system operations involving flow of energy, liquids or gases, electrical or RF signals, fuel, hydraulic fluid, air, oxygen, etc. Additionally, animation can illustrate progressive action in various stages of an operation, mechanical motion, or energy. The advantages of animation are that the animation can be played repeatedly with minimal preparation time.

5.3.3.28 Animated electromechanical physical objects. Animated electromechanical physical objects shall be as follows:

a. Panel type (i.e., 2-D or 3-D) trainers that enhance the understanding of a component, system, process, or system operation.
b. Animatronics that provide practice to facilitate the mastery of a learning objective that requires active interaction with an animated three-dimensional model of a living thing.
c. Mission and scenario related animations that provide practice to facilitate the mastery of a learning objective that requires active interaction with multiple animated three-dimensional models.

5.3.3.29 Human factors engineering requirements. The concept behind human engineering is to build a facility, workspace, or equipment with human limitations as the guiding precept to achieve efficiency, reliability, and safety during system operation, training, and maintenance. Human factors engineering covers general design criteria for systems, subsystems, equipment, and facilities ranging from lighting to audio displays to workstation controls. MIL-STD-1472 provides guidance on human engineering design criteria, principles, and practices.

5.3.3.30 Lasers. When procuring trainers or training equipment that utilize lasers, ensure the SOW requires contractor compliance with 21 CFR 1040.10, 1040.11, and ANSI Z136.1-1999.

5.3.3.31 Data plates, identification plates, and other marking. Data and identification plates identify specific information, components, or functions of a system. They also identify subassemblies of a trainer group (e.g., 1 of 3, 2 of 3, etc.). MIL-PRF-TRNRS provides a list of required information for data and identification plates. In addition, MIL-PRF-TRNRS provides direction on marking components ranging from plug-in assemblies to fluid transmission lines.

5.3.3.32 Safety requirements. Careful consideration is required during the design phase of the trainer regarding safety. The trainer assembly should include safety labels or markings identifying hazardous areas or items. Some of these areas of concern are high-voltage wiring, high-pressure lines, chemicals, electronics radiating RF energy, noise levels, lasers, high temperatures, raised surfaces, and fast-acting mechanisms. Any installed pyrotechnics should be inert. Inert pyrotechnics still provide the necessary training, but reduce the possibility of a mishap. Ensuring personnel safety should be a primary consideration during the acquisition of

training equipment. After determining the trainer features that are required, analyze those features to ensure that the necessary safety precautions are part of the system design.

5.3.3.33 Workmanship. Workmanship shall be in accordance with best industrial practices. Additional requirements for workmanship are specified in MIL-PRF-TRNRS for the following:

a. Cleaning.
b. Threaded fasteners.
c. Wiring.
d. Shielding on wires and cables.

5.3.3.34 Modifications, changes, and configuration control. Any modification incorporated into the actual end item should also be incorporated into an existing trainer. Include a provision in the contract for the documentation of modifications or changes that have been incorporated. A configuration management plan should be developed that establishes the requirements for configuration control.

5.3.3.35 Structural integrity. When planning the trainer requirements, determine the appropriate structural materials needed in the construction. Remember to keep in mind the maximum number of personnel (students and instructors) that the trainer must support. Structural considerations include the following:

a. Materials that will reduce or prevent parts, components, and welded joints from working loose during their intended service life.
b. Locking mechanisms for parts or components on trainers with motion capability (emergency use).
c. Supporting structure covering trainer component weight, center of gravity, and weight of personnel during training.

5.3.4 Availability. Availability measures the degree percentage or probability that a system will be ready or available when required for use. It is necessary to specify the required Operational Availability (A_o) and Inherent Availability (A_i) in the SOW. See MIL-PRF-TRNRS, paragraph 3.3 for A_o and A_i requirements.

5.3.5 Reliability. Reliability requirements are provided in MIL-PRF-TRNRS, paragraph 3.4. MIL-HDBK-781 provides guidance for reliability test methods, plans, and environments for engineering development, qualification, and production.

5.3.5.1 Reliability requirements. Reliability requirements identify:

a. The reliability program.

b. Reliability engineering.
c. Reliability program design reviews.
d. The monitoring and controlling of subcontractors and suppliers reliability programs.
e. Reliability Development and Growth Test (RDGT) program.

5.3.5.1.1 Reliability program. The contractor should be required to establish and implement a reliability program in accordance with the design and performance requirements of the contract. The contractor should include a means for ensuring that the conclusions of reliability analyses result in changes to the trainer design.

5.3.5.1.2 Reliability engineering. Reliability engineering should be an integral part of the trainer design process (including design changes).

5.3.5.1.3 Reliability Development and Growth Test (RDGT) program. An RDGT program is conducted for enhancing system reliability through the identification, analysis, and correction of failures and the verification of the corrective action effectiveness. Mere repair of the test item does not constitute corrective action. To enhance mission reliability, corrective action is focused on mission-critical failure modes. To enhance basic reliability, corrective action is focused on the most frequent failure modes regardless of their mission criticality. These efforts need to be balanced to meet predicted growth for both parameters. Growth testing emphasizes performance monitoring, failure detection, failure analysis, and the incorporation and verification of design corrections to prevent recurrence of failures. An RDGT program is instituted if ordered by the procuring activity.

5.3.5.1.3.1 RDGT plan. An RDGT plan should be prepared and should include the following (subject to approval by the procuring activity prior to initiation of testing):

a. Test objectives and requirements, including the selected growth model and growth rate and the rationale for both selections.
b. Identification of the equipment to be tested and the number of test items of each equipment.
c. Test conditions (environmental, operational profiles, performance profiles, and the duty cycle).
d. Test schedules expressed in calendar time and item life units (cycles), including the test milestones and test program review schedule.
e. Test ground rules, chargeability criteria, and interface boundaries.
f. Test facility and equipment descriptions and requirements.
g. Procedures and timing of corrective actions.
h. Time and resources designated for the incorporation of design corrections.
i. Data collection and recording requirements.
j. Failure Reporting, Analysis, and Corrective Action System (FRACAS).

k. Government furnished property requirements.
l. Description of preventive maintenance to be accomplished during test.
m. Final disposition of test items.

5.3.5.1.3.2 Procuring approval. As specified by the procuring activity, the RDGT plan is submitted to the procuring activity for its review and approval. The approved plan is then incorporated into the contract, becoming the basis for contractual compliance.

5.3.5.1.4 Reliability Failure Reporting, Analysis, and Corrective Action System (FRACAS). The purpose of FRACAS is to establish a closed loop failure reporting system, procedures for analysis of failures to determine cause, and documentation for recording corrective action taken.

5.3.5.1.4.1 Closed loop system. It is advisable to include a requirement in the SOW for the contractor to have some form of a closed loop system that collects, analyzes, and records failures that occur during specified levels of assembly, and test and check. The contractor's existing data collection, analysis, and corrective action method should be utilized, and modified only when necessary to meet the requirements that are specified by the procuring activity. This process should be accomplished prior to delivery and acceptance of the trainer by the procuring activity.

5.3.5.1.4.2 Failure reporting. Procedures for initiating failure reports, analyzing failures, and feedback for corrective action into the design due to failures, manufacturing, and test processes should be identified using flow diagrams depicting failed hardware and data flow. The analyses process provides for the establishment of categorizing the various causes of failures.

5.3.5.1.4.3 Report transcribing. The contractor's closed loop failure reporting system data should be transcribed to Government forms only if specifically required by the procuring activity.

5.3.5.1.4.4 Corrective action. The closed loop system should include provisions to ensure effective corrective action is taken on a timely basis. Corrective actions may include follow-up audits for reviewing all open failure reports, failure analyses, and corrective action suspense dates, while reporting all delinquencies to management. The cause of each failure occurrence should be clearly stated in the report.

5.3.5.1.5 Failure Modes, Effects and Criticality Analysis (FMECA). The trainer equipment design process uses FMECAs performed at the subsystem level in accordance with national and international standards. The FMECA plan, prepared in accordance with MIL-HDBK-2155 and national and international standards should be included in the Reliability Program Plan submitted by the contractor. This analysis identifies possible failure modes and evaluates the probability of occurrence. For each failure mode identified, a determination is made of the effect on the part, circuit, or unit in question and of the ultimate significance of its effect on the overall system performance, reliability, maintainability, and safety. This analysis should include a discussion of

the factors inherent in the design, or the quality program that will minimize the probability of occurrence of those failures having the most significant effect on trainer system performance, reliability, and maintainability. Whenever the trainer equipment design is evaluated, design changes occur, or data from engineering analysis and various test results become available, the FMECA will be revised to reflect previously unanalyzed failure modes. The results of the FMECAs will be reported via the reliability status reporting system.

5.3.5.1.6 Reliability critical items. The contractor normally identifies and controls reliability critical items. Reliability critical items should be identified in the Reliability Status Reports. The means to control reliability critical items should be described in the reliability program plan.

5.3.5.1.6.1 Classification of reliability critical items. An item is classified as reliability critical if one (1) or more of the following conditions are met:

a. Item represents a significant new development or application.
b. Item has Failure Modes and Effects Analysis (FMEA) Category I (Catastrophic) or Category II (Critical) failure modes.
c. Item has history indicating need for improvement.
d. Item has a known limited operating life, limited shelf life, or environmental sensitivity (e.g., vibration, thermal, etc.) that warrants controlled surveillance under specific conditions.
e. Item failure which can result in failure of the system and which is not compensated by redundancy or alternate operational procedures. These types of items are known as single failure point items.

5.3.5.1.6.2 Control of critical items. Tasks for control of reliability critical items include as a minimum the following:

a. Methods and procedures for procurement of critical items.
b. Criteria and procedures for the design application of critical items.
c. Procedures for controlling and monitoring critical items during and after manufacture; such as, date coding, traceability, assembly techniques, extended acceptance test requirements, contractor control of subcontractors and manufacturers controls, in-process controls, special handling, and storage requirements.

5.3.5.1.6.3 Sneak Circuit Analysis (SCA). The contractor should perform a SCA to identify potential defects that would result in unwanted functions or inhibit desired system functions when all components are operating as the design intended. An analysis should be performed using production-manufacturing documentation for each circuit analyzed. Functions and circuits to be analyzed include those that are critical to the training mission success and safety. A list of

proposed functions and circuits to be analyzed, and the priorities established for their analysis, is presented for Government approval at the CDR.

5.3.6 Maintainability. Maintainability requirements are provided in MIL-PRF-TRNRS, paragraph 3.5. MIL-HDBK-470 provides guidance for designing and developing maintainable products and systems. Emphasis being placed on design and construction should use the following considerations:

a. A minimum number of parts consistent with reliability and performance specified herein.
b. Minimum time and training necessary for assembly, disassembly, location of trouble sources, and maintenance including servicing.
c. Permit maintenance with common tools and equipment normally available commercially. The requirement for special purpose tools and equipment should be subject to approval by the procuring activity.
d. Permit adjustments, servicing, and replacement of components.
e. Permit rapid visual inspection of all parts and components that are most likely to fail and that could cause personnel hazards if they fail during use.
f. Designed to facilitate timely efficient repair of each failure, excluding parts acquisition time.
g. The design should keep the manpower requirements to a minimum (level of skill and number of personnel required to maintain the trainer).

5.3.6.1 Maintainability quantitative requirement. Quantitative maintainability requirements for the trainer system are specified in MIL-PRF-TRNRS:

5.3.6.2 Maintainability engineering. Maintainability engineering is an integral part of the trainer design process, including design changes. This handbook provides the guidance by which maintainability engineering will contribute to the design of the trainer including its fault detecting and diagnostic subsystems at all levels of application or maintenance. Maintainability engineering should closely interface with reliability engineering and safety.

5.3.6.3 Failure Modes and Effects Analysis (FMEA) - maintainability information. Maintainability information is developed in conjunction with the FMECA as previously described in the reliability section of this document.

5.3.6.4 Accessibility. Trainer assemblies, subassemblies, components, and equipment should be made readily accessible as required for operation, maintenance, and training purposes. See MIL-PRF-TRNRS, paragraph 3.5.1 for accessibility requirements. Table 2 provides a job aid for tailoring MIL-PRF-TRNRS for applicability to the specific trainer acquisition. Additional accessibility requirements that are beyond the scope of those selected from Table 2 may be added as required.

TABLE 2. **Checklist for tailoring accessibility requirements in the SOW.**

REQUIREMENT	INCLUDE IN SOW?		APPLICABLE MIL-PRF-TRNRS PARAGRAPH
	YES	NO	
ACCESSIBILITY			3.5.1
Assemblies			3.5.1.1
Replacement of module assemblies			3.5.1.2
Wiring board extender cards			3.5.1.3
Covers, panels, and doors			3.5.1.4
Removal, replacement, and movement of component parts			3.5.1.5
Replacement of parts and microelectronic functional devices			3.5.1.6
Lamps			3.5.1.7
Cable slack			3.5.1.8

5.3.6.4.1 Adjustment and calibration. The time required for adjustment and calibration due to the replacement of an assembly or part should be consistent with the specified quantitative maintainability requirements.

5.3.7 Special tools. Every effort should be made to utilize common tools. Special tools should be procured only when common tools are inadequate. See MIL-PRF-TRNRS, paragraph 3.6 for special tools requirements.

5.3.8 Trainer Computer System (TCS) requirements. The TCS consists of the trainer computer system, the Trainer Computer System Software (TCSS), and the network required for a trainer system. The acquisition of hardware and software will vary depending on the complexity of the trainer. Complex trainers may require more than just the software required to run the training exercises. It may require utility programs, maintenance programs, and programs that enable the trainer to interface with other training systems. A statement should be included in Section M of the RFP informing offerors that inclusion of royalties, run-time fees, and/or proprietary software is prohibited. See MIL-PRF-TRNRS, paragraph 3.7 for trainer software requirements. Table 3 provides a job aid for tailoring MIL-PRF-TRNRS for applicability to the specific trainer acquisition. Additional trainer software requirements that are beyond the scope of those selected from Table 3 may be added as required.

TABLE 3. **Checklist for tailoring TCS requirements in the SOW.**

REQUIREMENT	INCLUDE IN SOW?		APPLICABLE MIL-PRF-TRNRS PARAGRAPH
	YES	NO	
TRAINER COMPUTER SYSTEM (TCS) REQUIREMENTS			3.7
TCS instructor and student station hardware requirements			3.7.1
TCS peripheral compatibility			3.7.1.1
Removable storage media for classified information			3.7.1.2
Processing resource and reserve capacity			3.7.1.3
• Spare main memory			3.7.1.3.1
• Spare mass storage			3.7.1.3.2
• Spare processing capacity			3.1.7.3.3
• Synchronous real-time functions			3.7.1.3.3.1
• Non-synchronous functions			3.7.1.3.3.2
• Spare input/output capacity			3.7.1.3.4
Trainer Computer System Software (TCSS) requirements			3.7.2
Trainer system firmware			3.7.2.1
TCSS retention			3.7.2.2
Trainer computer software			3.7.2.3
• Real-time simulation, control, and processing programs			3.7.2.3.1
• Utility programs			3.7.2.3.2
• Maintenance and test programs			3.7.2.3.3
• Computer diagnostic programs			3.7.2.3.4
• Operating system software			3.7.2.3.5
• Cycle time measurement programs			3.7.2.3.6
• TCSS source code			3.7.2.3.7
• Software configuration control tool			3.7.2.3.8
• Generating executable code and data files			3.7.2.3.9
• Interactive creation and change			3.7.2.3.10
Trainer Computer System (TCS) network			3.7.3

5.3.8.1 Processing resource and reserve capacity. The contractor should analyze the processing resource and reserve requirements, such as timing, memory utilization, or Input/output

(I/O) channel utilization, identified in the contract and allocate these resources among the Computer Software Configuration Items (CSCI). The allocation of these resources to CSCI will be documented in the Software Requirements Specification (SRS) for that CSCI. The contractor monitors the utilization of processing resources for the duration of the contract and reallocates the resources as necessary to satisfy the reserve requirements. Measured resource utilization at the time of delivery will be documented in the Software Product Specification (SPS) for each CSCI. MIL-PRF-TRNRS specifies processing resource and reserve capacity requirements for:

a. Spare main memory.
b. Spare mass storage.
c. Spare processing capacity.
d. Synchronous real-time functions.
e. Non-synchronous functions.
f. Spare input/output capacity.

5.3.8.2 TCSS retention. Unless otherwise directed by the procuring activity, the contractor retains all software during the life of applicable contracts and/or use of the trainer. Disposition instructions will be requested from the procuring activity.

5.3.8.3 Trainer computer software. Unless otherwise specified by the procuring activity, the contractor is responsible for the correction of all software programming errors. Trainer System Software (TSS) revisions are made in accordance with prior agreements. The trainer manufacturer is not allowed to modify computer programs obtained from the computer vendor or a commercial software vendor.

5.3.9 Overlying architecture. The DoD Joint Technical Architecture (JTA) is a document that mandates a minimum set of standards and guidelines to form a general-purpose architecture for simulation reuse and interoperability. Complex trainers that are planned to be linked (or may have potential for being linked) with other trainers, distributed mission planning system, or distributed simulations should be developed using the JTA mandated standards. The JTA should be used by anyone involved in the management, development, or acquisition of new or improved information systems within the DoD. The JTA defines the underlying technical standards and data relationships. This information forms the basis for system architecture design and ensures the commonality of effort in the system design process. In cases where the trainer is planned to be subject to these conditions, then MIL-PRF-TRNRS paragraph 3.8 should be applied in the SOW. Table 4 provides a job aid for tailoring MIL-PRF-TRNRS for applicability to the specific trainer acquisition. Additional requirements that are beyond the scope of those selected from Table 4 may be added as required.

TABLE 4. **Checklist for tailoring overlying architecture requirements in the SOW.**

REQUIREMENT	INCLUDE IN SOW?		APPLICABLE MIL-PRF-TRNRS PARAGRAPH
	YES	NO	
OVERLYING ARCHITECTURE			3.8
High Level Architecture (HLA)			3.8.1
Joint Technical Architecture (JTA)			3.8.2

5.3.9.1 High Level Architecture (HLA). To specify for HLA compliance, it is necessary to state what federation the simulation will belong to, and then include the following statement in the SOW:

"Simulation software shall comply with the HLA rules, the HLA interface specification, and the HLA object model template as described in IEEE 1516-2000, IEEE 1516.1-2000 and IEEE 1516.2-2000, respectively".

It may also be necessary to specify a requirement for HLA federate compliance testing and certification. In addition, imposing a development-process requirement called Federal Development and Execution Process (FEDEP) would violate the principle of performance specifications, therefore it cannot be included in specifications.

5.3.9.2 Joint Technical Architecture (JTA) mandates. The JTA mandates commercial standards and practices to the maximum extent possible. Use of JTA-mandated standards or specifications in acquisition solicitations will not require a waiver from standards reform policies. All mandatory standards in the JTA are of the types that have been identified by the DoD Standards Reform as waiver-free or for which an exemption has already been obtained. The standards selection criteria used throughout the JTA focus on mandating only those items critical to interoperability that are based primarily on commercial open-system technology, are implementable, and have strong support in the commercial marketplace. The standards cited in the JTA may include commercial, Federal, and military standards and specifications, and various other kinds of authoritative documents and publications.

5.3.10 Interactive Multimedia Instruction (IMI) material. IMI material will be provided in accordance with MIL-PRF-29612, paragraphs 3.2.10 and 4.3.10. MIL-HDBK-29612-3 provides guidance for the development of IMI. Refer to MIL-PRF-TRNRS, paragraph 3.9 for IMI requirements.

5.3.11 Trainer accessory requirements. Trainer accessories include items required in support of the use and protection of the trainer. Table 5 provides a job aid for tailoring MIL-PRF-TRNRS for applicability to the specific trainer acquisition. Additional trainer accessory

requirements that are beyond the scope of those selected from Table 5 may be added as required. Refer to MIL-PRF-TRNRS, paragraph 3.10 for trainer accessory requirements.

TABLE 5. **Checklist for tailoring trainer accessory requirements in the SOW.**

REQUIREMENT	INCLUDE IN SOW?		APPLICABLE MIL-PRF-TRNRS PARAGRAPH
	YES	NO	
TRAINER ACCESSORY REQUIREMENTS			3.10
Casters			3.10.1
Screw jacks			3.10.2
Forklift slots			3.10.3
Drip pans			3.10.4
Covers			3.10.5
• Waterproof soft covers			3.10.5.1
• Waterproof hard covers			3.10.5.2
• Dust covers			3.10.5.3
• Security covers			3.10.5.4

5.3.12 Environmental conditions. Requirements for environmental conditions are provided in Table 4 of MIL-PRF-TRNRS. These requirements cover a wide range of temperatures, altitudes, and humidity for the classroom and transportation and storage. These requirements should be tailored to fit the training need of each acquisition. Requirements for environmental conditions are provided in MIL-PRF-TRNRS, paragraph 3.11.

5.3.13 Transportability and storage. Requirements for transportability and storage are provided in MIL-PRF-TRNRS, paragraph 3.12. Specific modes of transportation should be stated in the SOW.

5.3.13.1 Assembly and disassembly for shipment. Trainers must be constructed to allow for partial disassembly when size, weight, and cost limitations are a factor in shipment.

5.3.13.2 Marking for shipment and storage. All trainers are to be marked for shipment and storage in accordance with MIL-STD-129.

5.3.14 Configuration management. For complex trainers a configuration management process will need to be established. Figure 2 provides an example of configuration management provisions that could be tailored for use in a SOW.

FIGURE 2. **An example of configuration management provisions for use in a trainer SOW.**

"4.1 General. The contractor shall initiate an organized configuration control and documentation program for the trainers, related end items, and data during development and manufacture and provide documented data upon final trainer acceptance.

4.2 Configuration Management (CM). The contractor shall prepare a CM Plan for hardware and software administered as part of the overall aircraft CM Plan. The CM Plan shall be kept current throughout the life of the program. In accordance with ANSI/EIA 649, the CM plan shall define the proposed approach to managing the trainer configuration documents to ensure that the final delivery configuration represents the Physical Configuration Audit (PCA) baseline aircraft and/or system. The CM Plan shall set forth the policy for incorporation of aircraft and/or system Engineering Change Proposals (ECP) after final approval by the Government. The contractor's CM Plan shall define how the contractor will manage Class I and II configuration changes prior to final Government acceptance of the PCA Baseline Aircraft Trainer.

4.3 Basic configuration. The basic configuration of the Initial Operational Capability (IOC) Trainer shall consist of the components and systems defined in this System Specification and conform to the aircraft data provided prior to the Trainer hardware and software design freeze. The IOC Trainer baseline shall be upgraded to conform to the PCA aircraft and/or system configuration within the established program schedule. The contractor shall develop, implement, install, test, verify the IOC Trainer upgrade, and be responsible for ensuring that the upgrade conforms to the PCA aircraft and/or system configuration. All applicable IOC Trainer data shall be upgraded to reflect the PCA configuration.

4.4 Aircraft configuration baseline. The Trainer IOC baseline configuration for aircraft and/or system related data (to be implemented in the trainers) shall be established 60 days prior to the Trainer IOC. The configuration update baseline (to be implemented in the trainers) shall be the design baseline aircraft and/or system as defined during the aircraft and/or system PCA.

4.5 Configuration control. The contractor shall establish configuration control procedures in accordance with ANSI/EIA 649, and incorporate these into the CM Plan. Any proposed hardware and/or software update subscription service shall be discussed in the CM Plan.

4.6 Configuration status accounting. The contractor shall establish a Configuration Status Accounting System in accordance with ANSI/EIA 649.

4.7 Configuration audits. The contractor shall prepare a Configuration Audit Plan as a part of the CM Plan. This plan will encompass both Functional and Physical Configuration Audits.

FIGURE 2. **An example of configuration management provisions for use in a trainer SOW -Continued.**

4.7.1 Functional Configuration Audit (FCA). The FCA shall be conducted in accordance with ANSI/EIA 649 and the Configuration Audit Plan contained in the CM Plan.

4.7.2 Physical Configuration Audit (PCA). The PCAs shall be conducted in accordance with ANSI/EIA 649 to verify, prior to acceptance testing, that the trainer built is the same as the trainer designed."

5.3.15 Quality assurance. Quality assurance requirements should be included in the SOW. Figure 3 provides an example of quality assurance provisions that could be tailored for use in a SOW.

FIGURE 3. **Example of quality assurance provisions.**

"5.4 Quality assurance provisions.

5.4.1 Quality assurance provisions, general. An organized quality assurance program should be established in accordance with ASQC-Q9000.1. Certain requirements herein, such as testing, may be considered common to quality, reliability, and maintainability programs. The quality assurance program should be planned and used in a manner to effectively support the contractor's reliability and maintainability program.

5.4.2 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. The supplier may use his own or any other facilities suitable for the purpose of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specifications where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

5.4.3 Examination of product. Each trainer should be inspected by the Government to ensure compliance with the requirements specified in the detail specification with respect to materials, parts, design, construction, safety, workmanship, finish, interchangeability where applicable, nameplates, data plates, and markings.

5.4.4 Quality conformance inspection. The examination and testing of trainers should be classified as quality conformance inspection and should consist of inspection methods specified under 4.X.X."

5.3.16 Trainer Test and Evaluation (T&E). The purpose of the T&E is to gather data for evaluation and subsequent determination of the degree to which the device meets the specification requirements for performance, reliability, maintainability, availability, logistical supportability, and interoperability. The following are provides descriptions of the T&E events and documents that may apply to a trainer acquisition.

5.3.16.1 Training equipment acceptance conference. A training equipment acceptance conference should be convened to accomplish the formal inspection and acceptance of the trainers, training equipment, and related items specified in the contract. Attendees at this conference should witness or perform the acceptance inspections and ensure compliance with all applicable quality assurance provisions.

5.3.16.2 Acceptance inspection. Individual engineering acceptance tests should be performed in accordance with the Government approved test outlines describing the tests to be performed and the data to be recorded. Acceptance methods and procedures should be as specified in the contract.

5.3.16.3 Acceptance test outlines. Individual engineering test outlines reflecting the trainer or individual trainer specification requirements should be provided in accordance with the contract. These engineering test outlines should define and describe the tests to be performed and data to be recorded, and should be subject to review and approval by the procuring activity. These outlines should be submitted to the using activity for formal approval a minimum of 45 days prior to the scheduled acceptance inspection for the related training equipment as follows:

a. The Government quality assurance representatives should certify to the local cognizant Government contracting authority that the trainer complies with the applicable specification and is ready for source acceptance inspection/testing.
b. The contractor should certify in writing, to the local cognizant Government contract authority and the procurement activities that the trainer has completed three (3) continuous end-to-end cycles of operation in accordance with the Acceptance Test Procedures (ATP) and Manuals of Operation and Maintenance Instructions (MOMI) or run continuously for six (6) hours whichever is longer.
c. The local cognizant Government contract authority should provide written notification, to the procuring and user activities, that the trainer is ready for source acceptance inspection/testing.
d. The procuring activity should then convene the source acceptance inspection. The source acceptance inspection team should consist of the local Government Quality Assurance Representative (QAR), procurement activity, and user activity.

5.3.16.4 Source acceptance inspection/testing. Source acceptance inspection/testing should consist of the following:

a. The PCA using the applicable specification(s), drawings, and appropriate Illustrated Parts Breakdown (IPB).
b. Review of technical data for delivery compliance.
c. Operational demonstration by contractor, if requested by the procuring activity.
d. Unless otherwise specified by the procuring activity, designated Government representatives should complete a satisfactory functional test consisting of three (3) trouble free end-to-end cycles of operation using the ATP and MOMI.
e. Discrepancies should be resolved prior to provisional acceptance of the trainer, unless otherwise specified by the procuring activity.
f. On-site installation and checkout. After the trainer has been installed at the user activity the trainer should be operated for three (3) complete end-to-end cycles of operation using the MOMI. Successful completion of the above should constitute delivery of the trainer.
g. Failure logs. The contractor should maintain a log of all parts failures in the equipment service/historical record specified including GFE, which occur during the test calibration period. The log should include the part number of the failed part, location of failed part, cause of failure if known, and number of cycles and hours on the trainer at the time of failure. This log should be made available to the procuring activity at the beginning of inspection. This log should also be maintained on total calibration and testing time and should be authenticated by the contractor QAR.
h. Human-factor compliance tests. Each trainer should be tested from a training effectiveness standpoint to demonstrate that training requirements are satisfied and to ensure compliance with the human-factor requirements of MIL-STD-1472.
i. Operating tests. The trainer or subassembly should be energized for a period of one (1) hour and subjected to an operating test in an ambient temperature of 65 to 90 degrees Fahrenheit for not less than six (6) hours to ensure the proper functioning of the trainer or subassembly. This includes all operating control supply line voltage, ranges and frequencies, conditions of extreme limits and conformance to applicable safety requirements. During the operation period, three (3) complete cycles of operation should be accomplished in the presence of the Government inspector to demonstrate compliance with the requirements of the applicable specifications. A cycle of operation is considered to be one (1) complete end-to-end sequential operation of the trainer in accordance with the operating instructions contained in the trainer MOMI, regardless of the time required. The trainer should be capable of meeting the performance requirements without alignment or adjustment other than the accessible controls employed for operation. No repairs should be permitted during the operational tests. If repairs are required, the test should be repeated after the necessary repairs or replacements have been made. Trainers requiring interconnection for complete system demonstration should be tested as a unit to ensure proper operation of all components. Associated trainer power supply equipment, such as power conversion units, direct-current power units, cables and power distribution junction

boxes, all applicable system SE and special tools should be functionally tested in conjunction with applicable trainers prior to delivery.

j. Reliability and maintainability demonstrations and tests. Reliability and maintainability demonstrations and tests, required by the contract, should be subject to the following criteria: These tests may be performed separately or in conjunction with any other tests to which the trainers are subjected at the discretion of the Government and as specified in the individual trainer reliability demonstration and test procedures. Equipment mission, failure and accept/reject criteria should also be defined in the reliability demonstration and test procedures for each trainer.

k. Monitoring instruments should be used to observe essential operating characteristics and to determine the time of failure.

l. A failure will be considered to have occurred whenever the trainer requires corrective maintenance action in order to perform its function within specified limits.

m. A pattern failure should be considered to have occurred when two (2) or more failures of the same part exceed in its identical or equivalent application exceeds its combined predicted failure rate. Necessary corrective action, at no cost to the Government, should be required for pattern failures.

n. Maintainability verification. The contractor should verify that all parts and components are identifiable in the IPB and are readily accessible for servicing and replacement, and that all maintenance repair and set-up instructions in the MOMI are complete and valid. Contractor verification includes identifying all maintenance tasks and performing time studies on them in accordance with the following:

(1) These tasks should be performed, in a manner representative of the normal equipment maintenance environment, by following written instructions prepared for operating personnel with a skill level equivalent to laboratory technicians or skilled mechanics. The time to accomplish each maintenance task should include time for preparation, fault location, correction of fault, and adjustment, re-calibration, and final test. Time should be recorded in hours and decimal fractions there of.

(2) Maintainability should be expressed in terms of mean active maintenance downtime as defined in MIL-HDBK-470, and as determined herein. A period representing the service life should be expressed in hours of operation or cycles of operation, as appropriate. Active maintenance downtime studies should be made and recorded for each different maintenance task estimated to occur during this period. The number of times each task occurs during this period should be recorded. This should be done through use of factual failure rate (reliability) data. If this factual data is not available, estimated failure rate data should be used. The mean active maintenance downtime should then be computed by adding all of the down times for the period and dividing by the total number of tasks for the period.

o. Electromagnetic interference suppression test. Electronic trainers and subassemblies should be tested to determine conformance to the electromagnetic interference suppression requirements of MIL-PRF-TRNRS by means of the applicable test methods specified in MIL-STD-464.
p. Temperature measuring. Temperature measuring instruments should be placed at critical points throughout the trainer, covering suspected high temperature areas. Data should be recorded during each cycle at the end of the period of high voltage variation indicated under the power requirements of the related specification. The log of the data obtained should clearly identify the location of the instrument in or on the trainer, the temperature recorded, and ambient temperature for which the trainer was designed.
q. Controls and control circuits. The trainer subassemblies should be tested to determine the suitability of controls and control circuits for satisfactory mechanical and electrical operation.
r. Power tests. Power tests should be performed as necessary to demonstrate compliance with the electrical, hydraulic, and pneumatic operational requirements of the contract.
s. Environmental tests. Environmental tests should be performed as necessary to establish durability and reliability of the trainer materials and components under the environmental conditions of service operation.
t. Test methods and procedures for microelectronics parts should be in accordance with the contract.
u. The contractor should provide one hundred percent prescreening of active components such as but not limited to integrated circuits, hybrids, semiconductors, etc., as appropriate; to provide a quality product. Active component parts prescreening at the electronic equipment manufacturer's plant should consist of a functional check of critical parameters at ambient and the minimum and maximum operating temperatures specified for the part. The contractor should submit a plan that addresses the current incoming inspection procedures and cost associated with identifying a defective part at incoming inspection, repair at the module and repair at the end item level. This plan, subject to procuring activity approval, should provide a cost-effective approach to ensure defective parts are identified at the lowest level possible consistent with good manufacturing practices. In the event that the Government determines, based upon the plan submitted, that 1) it is not cost-effective to conduct one hundred percent active component prescreening as described herein and/or 2) the contractor's recommended approach referred to herein is more cost-effective, the contracting officer should modify the contract. The contract can be modified by either deleting the requirement for one hundred percent active component prescreening as described herein and/or revising the requirement for one hundred percent active component re-screening to incorporate the contractor's recommended approach or portions thereof, as appropriate.
v. Particle Impact Noise Detection (PIND) screening of unglassivated devices with internal cavities should be performed, as needed. Parts with known problems should not be used.

If this is not practical, special tests to reduce the impact of known problems should be applied.

w. The contractor should maintain a log of the re-screened parts, including the quantity tested and fallout. Summary information documenting the results of all re-screening should be provided in the reliability status report.

x. Shop Replaceable Assembly (SRA)/module level screening. Manufacturing screening employing rapid thermal cycling should be performed on all newly designed and modified full scale development and production electronic SRAs and modules. Each SRA/module should undergo ten thermal cycles, non-operational, between minus 54 degrees centigrade and plus 71 degree centigrade with a temperature rate of change of at least 15 degree centigrade per minute. Each SRA/module should be subjected to both a pre and post screening performance test to verify proper operation. If the SRA/module does not pass the post screening performance test, the unit should be resubmitted to the screening test. Details of parameters to be tested should be identified in the individual equipment test procedures. The reliability program plan should contain the test details and provisions to modify/adjust SRA/module level screening to be cost-effective based upon actual screening results when approved by the procuring activity.

5.3.16.5 Live fire testing. Live fire testing should be used to gain insight into potential design flaws so they can be corrected prior to entering full-scale production. This ensures that knowledge of trainer survivability and lethality is based on realistic testing of the trainer configured for combat against exposed threats, and emphasis on testing vulnerability with respect to potential user casualties (e.g., individual soldiers, armor crews, aircraft crews, ship crews, tactical vehicle crews, etc.).

5.3.17 Trainer support requirements. The Government may require operation, maintenance and logistics support for a period of time after delivery and acceptance of a complex trainer. The scope of support required can range from Contractor Operation and Maintenance Support (COMS) to total Contractor Logistics Support (CLS). Total CLS normally includes COMS, spare and repair parts, and other items and services needed to fully support (i.e., turnkey) trainer operations. The scope of these support requirements should be included in the SOW.

5.3.17.1 Specification maintenance. As the trainer specification is a dynamic document, it will be necessary to include the requirement for maintenance of the specification in the SOW. Contractor developed specifications should be maintained in accordance with ANSI/EIA 649.

5.3.17.2 Refurbishment. Refurbishment consists of the effort necessary to restore the trainers and related items (specified in the detail specification) to final delivery condition. This includes touchup of paint and finish, correction of defects and malfunctions, recalibration of equipment as applicable, and repair of any discrepancies resulting from the use of these items during the instructor training program. Additionally, included in the refurbishment is the

incorporation of authorized modifications and changes to the instructor-training program. These actions need to be accomplished to the trainer and related items prior to acceptance and delivery.

5.3.18 Data requirements. As MIL-PRF-TRNRS is not a data product specification, data cannot be procured by citing MIL-PRF-TRNRS. However, the data that supports the development and operation of trainers can be procured by citing the proper requirements in Data Item Descriptions (DIDs) under a separate Contract Line Item Number (CLIN). Each acquisition manager will need to determine data requirements for the subject acquisition and select data items from the approved DIDs in the AMSDL and document them in DD Forms 1423.

5.3.18.1 Instructional Systems Development (ISD) data. Training data products are produced during the analysis phase of the Instructional Systems Development/Systems Approach to Training (ISD/SAT) process. MIL-PRF-29612 is the performance specification for training data products. MIL-PRF-29612 is cited in the AMSDL, as the source document for DIDs DI-SESS-81517B through -81527B. When it is necessary to obtain the data, the applicable DIDs must be listed on the CDRL (DD Form 1423), except where the DoD Federal Acquisition Regulation Supplement exempts the requirement for a DD Form 1423. Table 6 provides a cross-reference among MIL-PRF-29612, its related DIDs, MIL-HDBK-29612-1, and the applicability to MIL-PRF-TRNRS. The paragraphs in MIL-HDBK-29612-1 provide guidance for applying proper performance requirements and verification criteria when tailoring training data product content requirements.

TABLE 6. **DIDs, MIL-PRF-29612, and MIL-HDBK-29612-1 cross-reference.**

DID DI-SESS-	DID Paragraph	MIL-PRF-29612 Paragraph	MIL-HDBK-29612-1 Paragraph	Applicability to MIL-PRF-TRNRS
81519B	2.4 thru 2.4.2.d(9)	4.3.3, 4.3.3.1, 4.3.3.1.g, 4.3.3.1.h	5.1.3.2.c, 5.1.3.2.c(1), 5.1.3.2.c(2)	Data for the functional characteristics of the trainer/training equipment in terms of performance capabilities.
81519B	2.4.2.e, e(1) and e(2)	4.3.3, 4.3.3.1, 4.3.3.1.h, 4.3.3.2, 4.3.3.2.a	5.1.3.2.c, 5.1.3.2.c(2)	"
81519B	2.4.3 thru 2.4.3.c	4.3.3, 4.3.3.1, 4.3.3.1.k	5.1.3.2.c, 5.1.3.2.c(4)	PrePlanned Product Improvement data to support the functional characteristics defined in paragraph 2.4.2 of the DID.
81527B	2.2 thru 2.2.1	4.3.11, 4.3.11.1, 4.3.11.1.j	5.1.11.2.a, 5.1.11.2.a(1)	Data to support the trainer's software utilities.
81527B	2.2.1.d	4.3.11, 4.3.11.1, 4.3.11.1.a, 4.3.11.1.j	5.1.11.2.a, 5.1.11.2.a(1)	"

TABLE 6. **DIDs, MIL-PRF-29612, and MIL-HDBK-29612-1 cross-reference - Continued.**

DID DI-SESS-	DID Paragraph	MIL-PRF-29612 Paragraph	MIL-HDBK-29612-1 Paragraph	Applicability to MIL-PRF-TRNRS
81527B	2.2.1.e	4.3.11, 4.3.11.1, 4.3.11.1.j	5.1.11.2.a, 5.1.11.2.a(1)	"
81527B	2.2.2 thru 2.2.2.c	4.3.11, 4.3.11.1, 4.3.11.1.j	5.1.11.2.a, 5.1.11.2.a(2)	Data to provide procedures and information on support software file generation.
81527B	2.2.2.d	4.3.11, 4.3.11.1, 4.3.11.1.b, 4.3.11.1.j	5.1.11.2.a, 5.1.11.2.a(3)	"
81527B	2.2.2.e thru 2.2.3.b	4.3.11, 4.3.11.1, 4.3.11.1.j	5.1.11.2.a, 5.1.11.2.a(2)	Provides trainer software performance characteristics verification data.
81527B	2.2.3.c	4.3.11, 4.3.11.1, 4.3.11.1.c, 4.3.11.1.j	5.1.11.2.a, 5.1.11.2.a(3)	"
81527B	2.2.3.d and e	4.3.11, 4.3.11.1, 4.3.11.1.j	5.1.11.2.a, 5.1.11.2.a(3)	"
81527B	2.2.4 thru 2.2.4.b	4.3.11, 4.3.11.1, 4.3.11.1.j	5.1.11.2.a, 5.1.11.2.a(4)	Supplementary data essential to the use of the trainer software application data.
81527B	2.3 thru 2.3.1.g	4.3.11, 4.3.11.1, 4.3.11.1.k	5.1.11.2.b, 5.1.11.2.b(1)	Trainer system operating data; description of the training system.
81527B	2.3.2 and 2.3.2.a	4.3.11, 4.3.11.1, 4.3.11.1.h, 4.3.11.1.k	5.1.11.2.b, 5.1.11.2.b(1)	Training system operating procedures.
81527B	2.3.2.b thru 2.3.2.f	4.3.11, 4.3.11.1, 4.3.11.1.d, 4.3.11.1.h, 4.3.11.1.k	5.1.11.2.b, 5.1.11.2.b(1)	"
81527B	2.3.3	4.3.11, 4.3.11.1, 4.3.11.1.d, 4.3.11.1.k	5.1.11.2.b, 5.1.11.2.b(1)	A list of Learning Objectives (LO) satisfied by each training system component.
81527B	2.3.4 thru 2.3.4.e	4.3.11, 4.3.11.1, 4.3.11.1.g, 4.3.11.1.k	5.1.11.2.b, 5.1.11.2.b(2)	Emergency procedures.

TABLE 6. **DIDs, MIL-PRF-29612, and MIL-HDBK-29612-1 cross-reference - Continued.**

DID DI-SESS-	DID Paragraph	MIL-PRF-29612 Paragraph	MIL-HDBK-29612-1 Paragraph	Applicability to MIL-PRF-TRNRS
81527B	2.3.5	4.3.11, 4.3.11.1, 4.3.11.1.k	5.1.11.2.b, 5.1.11.2.b(1)	A bibliography of materials that can be used as references to understand the application of the training system.
81527B	2.3.6 thru 2.3.7.b	4.3.11, 4.3.11.1, 4.3.11.1.i, 4.3.11.1.k	5.1.11.2.b, 5.1.11.2.b(1)	Training syllabus. An outline of the training exercises and simulated malfunction capabilities of the training system.
81527B	2.3.8 thru 2.3.10.c	4.3.11, 4.3.11.1, 4.3.11.1.k	5.1.11.2.b, 5.1.11.2.b(1)	Detailed instructions on how to modify existing training exercises and develop new training exercises.

5.3.18.2 Typical training system data requirements. As previously stated (see 4.3.6.2) it is possible to procure data (e.g., reports, lists, manuals, publications, etc.) to support the development, administration, operation, and maintenance of the trainer by stating the requirement in the SOW and citing a DID (or base Technical Manuals on a generated Technical Manual Contract Requirements (TMCR) document). As a part of Acquisition Reform, many DIDs were cancelled and not replaced. For data requirements that have no specific DID it is necessary to cite a DID for a generic technical report such as DI-MISC-80508. Then in Block 16 of the DD-1423, specify the requirements for the data that is to be provided. Table 7 provides a listing of data (and applicable DIDs) that is representative of the data typically purchased with training systems. This table provides a job aid in the form of a checklist that can be used to select data requirements to support the life cycle of the trainer. Information related to each of the items listed in Table 7, is provided after the table.

TABLE 7. **Checklist for typical trainer system data requirements.**

TITLE	DID#	INCLUDE IN SOW?	
		YES	NO
Revisions to Existing Government Documents	DI-ADMN-80925		
Conference Agenda	DI-ADMN-81249A		
Conference Minutes	DI-ADMN-81250A		
Logistics Management Information Data Products	DI-ALSS-81529		

TABLE 7. **Checklist for typical training system data requirements - Continued.**

TITLE	DID#	INCLUDE IN SOW?	
		YES	NO
Logistics Management Information Summaries	DI-ALSS-81530		
Engineering Change Proposal	DI-CMAN-80639C		
Request for Deviation	DI-CMAN-80640C		
Technical Directive (TD)	DI-CMAN-81269A		
Trainer Facilities Report	DI-FACR-80966		
Equipment Inventory Records	DI-ILSS-81251		
Software Development Plan	DI-IPSC-81427A		
System/Subsystem Design Description	DI-IPSC-81432A		
Software Requirements Specification	DI-IPSC-81433A		
Interface Requirements Specification	DI-IPSC-81434A		
Software Design Description	DI-IPSC-81435A		
Database Design Description	DI-IPSC-81437A		
Interface Design Description	DI-IPSC-81436A		
Software Version Description	DI-IPSC-81442A		
Software User Manual	DI-IPSC-81443A		
Computer Programming Manual	DI-IPSC-81447A		
Computer Software Product End Items	DI-MCCR-80700		
Technical Report - Contractor's Progress, Status and Management Report	DI-MISC-80508		
Technical Report - Configuration Status Accounting Information	DI-MISC-80508		
Technical Report - Contract Funds Status Report (CFSR)	DI-MISC-80508		
Technical Report - Cost Breakdown Structure Detailed Report	DI-MISC-80508		
Scientific and Technical Report - Engineering Acceptance Test Outlines	DI-MISC-80711A		
Scientific and Technical Report - Engineering and Production Progress Report	DI-MISC-80711A		
Technical Report - Failure Report	DI-MISC-80508		
Technical Report - Receipt of Government Material Report	DI-MISC-80508		
Technical Report - Training Equipment Rejection/Non-Operable Parts Utilization Report	DI-MISC-80508		

TABLE 7. **Checklist for typical training system data requirements - Continued.**

TITLE	DID#	INCLUDE IN SOW?	
		YES	NO
Scientific and Technical Report	DI-MISC-80711A		
Training Equipment Summary	DI-MISC-81184		
Test Procedure	DI-NDTI-80603		
Test/Inspection Report	DI-NDTI-80809A		
Commercial Off The Shelf Manuals	TMCR		
Operation and Maintenance Manual (i.e., Trainer Manuals of Operation and Maintenance Instructions (MOMI))	TMCR		
Planned Maintenance System Manual	TMCR		

5.3.18.3 Trainer Manuals of Operation and Maintenance Instructions (MOMI). MOMIs provide requirements to set up, operate, maintain, service, adjust, calibrate, and repair the trainer and related end items. Preliminary copies of the trainer MOMI should be available for review, verification, and use during the applicable trainer source acceptance inspection. The TMCR is the contractual document that specifies the content and format of the MOMI. MOMI contents are described below:

5.3.18.3.1 Illustrated Parts Breakdown (IPB). An IPB for each trainer should be included. An IPB is used for ordering replacement components and parts only and should never be used as an assembly or maintenance manual.

5.3.18.3.2 Technical manuals. Copies of technical manuals, and graphic material containing current information that affects the maintenance and operation of the related end item and support equipment, should be provided with each set of trainers. Technical manuals include but are not necessarily limited to, maintenance manuals, operation and service manuals, IPBs, scheduled maintenance requirements manuals and card decks, information sheets, service bulletins, other manuals, and related documentation that are pertinent to the end item and trainer operation.

5.3.18.3.3 Photographic manuals. Photographic manuals should clearly depict the completed trainer, individual trainer subassembly, and suite of trainers. These manuals are provided and delivered concurrently with each trainer or suite of trainers.

5.3.18.3.4 Assembly/disassembly instructions. The trainer MOMI should include a set of assembly/disassembly instructions for each trainer as required for storage, transportability, and setup at the delivery site.

5.3.18.3.5 Equipment service/historical record. The contractor initiates and provides an equipment service/historical record for each trainer procured. The procuring activity provides blank forms and detailed instructions for the preparation of the equipment service/historical records. These records provide data for each trainer from completion of fabrication to acceptance inspection. Data entries should be initiated upon completion of the trainer fabrication effort and prior to the use of the trainer. Common data entries include (but may not necessarily be limited to):

a. ECPs and Technical Directives (TDs)/Modification Work Orders (MWOs) incorporated.
b. ECPs and TDs/MWOs applicable but not incorporated.
c. Trainer equipment failure data and corrective action.
d. Trainer operating hours.
e. Scheduled and unscheduled maintenance, inspections, and test results performed.
f. Any other data required.

5.3.18.3.6 Instructor training material. Training material should be provided for the instructor that contains data products relating to the associated series end items. Format and contents of the material provided should be in accordance with MIL-PRF-29612, or as otherwise directed by the procuring activity.

5.3.18.3.7 Alteration of operable system components. The trainer MOMI includes data and modification instructions in sufficient detail to permit service personnel to perform needed modifications on a standard related end item replacement part. All related end item parts, which have been modified for trainer use, will appear in the parts lists under the standard part number (a part number preceded by an asterisk indicates that it has been modified for trainer use).

5.3.19 Reports. Reports are submitted to provide management information covering the trainers, related items, and services. Training equipment reports normally provided include (but are not necessarily limited to):

5.3.19.1 Trainer facilities report. This report identifies the criteria and requirements for the design, construction, or modification to the trainer facilities.

5.3.19.2 Cost breakdown structure detailed report. This report provides detailed cost breakdown for each cost category through completion of the contract.

5.3.19.3 Receipt of Government material report. This report provides the contractor with a management tool. The report provides information for monitoring the acquisition progress of GFE and CFE items required for the trainer under procurement.

5.3.19.4 Training equipment rejected/non-operable parts utilization report. This one time report provides the contractor with the information necessary to document the authorized use of rejected or non-operable parts in the trainer being procured. The report should list each rejected and non-operable part used and establishes a basis for an appropriate delivery schedule or contract price adjustment for their use. The use of rejected and non-operable parts should be in accordance with MIL-PRF-TRNRS.

5.3.19.5 Configuration status accounting information. This quarterly report details current configuration, documentation, and identification numbers. Any revisions to the report should consist of complete, superseding replacement and/or additional pages (with revisions appropriately identified) as necessary, to reflect changes, modifications, corrections, additions, or deletions to the data contained in the report.

5.3.19.6 Test/inspection report. This report, for each contract item or order for the trainer, reflects the acceptance status and condition of the trainer at the time of acceptance by the procuring activity.

5.3.19.7 Contract Funds Status Report (CFSR). This monthly report provides the contractor with information necessary to maintain fiscal accountability of funding for the incorporation of related end item modifications, changes, and retrofit kits in the trainer, training parts, related items and services.

5.3.19.8 Engineering acceptance test outlines. Engineering acceptance test outlines define and describe the tests to be performed and data to be recorded, and are subject to review and approval by the procuring activity. These outlines are submitted to the using activity for formal approval a minimum of 45 days prior to the scheduled acceptance inspection for the related training equipment.

5.3.19.9 Program reports. There are numerous types of program reports including (but not limited to) minutes of conferences and design reviews, failure reports, and engineering and production progress reports, etc. It is vital to monitor the contractor's progress during design and development; the Engineering and Production Progress Report is a tool that provides the information needed to monitor the contractor's progress and should include:

a. Updates for each contract item or order indicating the previously scheduled and current actual completion percentage factor. The following elements are applicable to each trainer, related end items, and services specified in the Detailed Specification.

   (1) Overall planning and non-recurring detail engineering effort.
   (2) GFE requirement definition, allocations and receipts.
   (3) Vendor procurements actions.

(4) Contractor furnished related end item and trainer peculiar equipment and material availability.
(5) Availability or status of orders and allocations for applicable Ground Support Equipment (GSE) required.
(6) Fabrication or preparation effort.

b. The report should include detailed data defining any problem areas with reasons for the discrepancies (known or predicted) between planned and actual schedules and listing corrective action recommendations. Each progress report is a complete and self-contained document and supersedes the previous report.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The trainers and training equipment are intended for use by the students in the performance of trainer tasks (i.e., operate, repair, servicing, adjustment and troubleshooting of the various systems, subsystems, installations, components, and equipment of the related series end items, test equipment and ground support equipment applicable thereto at the specified levels of maintenance).

6.2 Associated documents. It is necessary to procure data products to support a trainer acquisition. These data products are procured by citing the applicable DID(s) on the DD Form 1423. The DIDs listed in Table 8 were current as of the date of this specification. The current issue of the AMSDL must be researched to ensure that only current and approved DIDs are cited on the DD Form 1423. Table 8 shows DIDs that can be used to provide training data that might be beneficial for trainer procurement.

TABLE 8. **DIDs related to a trainer procurement.**

DID Number	DID Title
TRAINING DATA PRODUCTS	
DI-SESS-81519B	Instructional Media Requirements Document
DI-SESS-81527B	Training System Support Document
TYPICAL TRAINER SYSTEM DATA PRODUCTS	
DI-ADMN-80925	Revisions to Existing Government Documents
DI-ADMN-81249A	Conference Agenda
DI-ADMN-81250A	Conference Minutes
DI-ALSS-81529	Logistics Management Information Data Products

TABLE 8. **DIDs related to a trainer procurement - Continued.**

DID Number	DID Title
DI-ALSS-81530	Logistics Management Information Summaries
DI-CMAN-80639C	Engineering Change Proposal
DI-CMAN-80640C	Request for Deviation
DI-CMAN-81269A	Technical Directive (TD)
DI-FACR-80966	Trainer Facilities Report
DI-ILSS-81251	Equipment Inventory Records
DI-IPSC-81427A	Software Development Plan
DI-IPSC-81432A	System/Subsystem Design Description
DI-IPSC-81433A	Software Requirements Specification
DI-IPSC-81434A	Interface Requirements Specification
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DI-IPSC-81447A	Computer Programming Manual
DI-MCCR-80700	Computer Software Product End Items
DI-MISC-80508	Technical Report - Contractor's Progress, Status and Management Report
DI-MISC-80508	Technical Report - Configuration Status Accounting Information
DI-MISC-80508	Technical Report - Contract Funds Status Report (CFSR)
DI-MISC-80508	Technical Report - Cost Breakdown Structure Detailed Report
DI-MISC-80508	Technical Report - Failure Report
DI-MISC-80508	Technical Report - Receipt of Government Material Report
DI-MISC-80508	Technical Report - Training Equipment Rejection/Non-Operable Parts Utilization Report
DI-MISC-80711A	Scientific and Technical Report - Engineering Acceptance Test Outlines
DI-MISC-80711A	Scientific and Technical Report - Engineering and Production Progress Report
DI-MISC-81184	Training Equipment Summary
DI-NDTI-80603	Test Procedure
DI-NDTI-80809A	Test/Inspection Report
TMCR	Commercial Off The Shelf Manuals
TMCR	Operation and Maintenance Manual (i.e., Trainer Manuals of Operation and Maintenance Instructions (MOMI))
TMCR	Planned Maintenance System Manual

6.3 Subject term (key word) listing.

Combination platform/component and simulator (hybrid) trainer
Operator trainer
Maintenance trainer
Trainer data requirements
Trainer performance requirements
Platform/component trainer
Simulator trainer
Trainer
Trainer support
Training equipment
Trainer test and evaluation

CONCLUDING MATERIAL

Custodians:
- Army - AV
- Navy - AS
- Air Force - 94
- Marine Corps - MC
- DLA - DH

Preparing Activity:
- Navy - AS
- (Project SESS-0021)

Review Activities:
- Army - TM
- Navy - SH, EC, TD
- Air Force - 11
- NSA - NS
- DLA - CS, GS, IS, DP

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.

2. The submitter of this form must complete blocks 4, 5, 6, and 7, and send to preparing activity.

3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:	**1. DOCUMENT NUMBER**	**2. DOCUMENT DATE** (*YYYYMMDD*)

3. DOCUMENT TITLE

4. NATURE OF CHANGE (*Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.*)

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (*Last, First, Middle Initial*)	b. ORGANIZATION	
c. ADDRESS (*Include ZIP Code*)	d. TELEPHONE (*Include Area Code*) (1) Commercial (2) DSN (*If applicable*)	**7. DATE SUBMITTED** (*YYYYMMDD*)

8. PREPARING ACTIVITY

a. NAME COMMANDER NAVAL AIR WARFARE CENTER AIRCRAFT DIVISION	b. TELEPHONE (*Include Area Code*) (1) Commercial (2) DSN (732) 323-2947 624-2947
c. ADDRESS (*Include ZIP Code*) CODE 414100B120-3 HIGHWAY 547 LAKEHURST, NJ 08733-5100	**IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:** Defense Standardization Program Office (DLSC-LM) 8725 John J. Kingman Road, Suite 2533 Fort Belvoir, Virginia 22060-6221 Telephone (703) 767-6888 DSN 427-6888

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